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**A COST ANALYSIS OF
CONSOLIDATING ARMY/NAVY FACILITY SUPPORT
ON THE
MONTEREY PENINSULA**

by

**Jonathan R. Landis
and
Andrew C. Wood**

December, 1993

Thesis Advisor:

William R. Gates

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A Cost Analysis of
Consolidating Army/Navy Facility Support
on the Monterey Peninsula

by

Jonathan R. Landis
Lieutenant, United States Navy
B.S., Michigan Technological University
and

Andrew C. Wood
Lieutenant, United States Navy
B.S., University of Notre Dame


Submitted in partial fulfillment
of the requirements for the degree of

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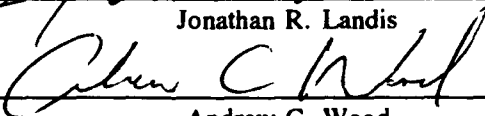
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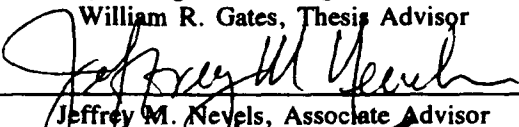

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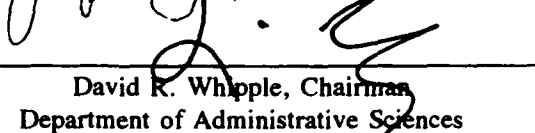
Author:


Andrew C. Wood

Approved by:


William R. Gates, Thesis Advisor


Jeffrey M. Nevels, Associate Advisor


David R. Whipple, Chairman
Department of Administrative Sciences

ABSTRACT

This thesis investigates the cost effectiveness of consolidating the facility support functions of the Defense Language Institute and remaining portions of Fort Ord with the Naval Postgraduate School's Public Works Department. The fiscally constrained operating environment facing DOD has required all organizations to search for more effective ways to operate. This study suggests that there are economies of scale associated with centralized facility support organizations that enable both NPS and DLI to attain cost savings under a consolidated facility support structure. The study analyzes the differential costs to service DLI and remaining portions of Fort Ord using an expanded NPS Public Works organization versus a separate and autonomous Army facility support organization. The study concludes that expanding the NPS Public Works Department to service the local Army installations is more cost effective than operating a separate Army facility support organization.

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I. INTRODUCTION

A. BACKGROUND

With the recently directed closure of Fort Ord, the Monterey Peninsula will be left with only two relatively small military establishments: the Naval Postgraduate School and the Defense Language Institute. The Naval Postgraduate School (NPS), located within the city limits of Monterey, has essentially provided its own base operations support since its inception. The Defense Language Institute (DLI), also located in Monterey, is not a stand alone organization. DLI has been a tenant command of Fort Ord since its arrival at the Presidio of Monterey in 1946. Thus, it has relied upon Fort Ord for essentially all of its base operations support requirements. The upcoming closure of Fort Ord requires that a new plan be laid out in order for DLI to continue operating at the Presidio of Monterey.

Base Operations Support (BOS) includes numerous functions required for an organization to operate; such as, supply/logistics, facility support, security, safety, fire protection, morale/recreation/welfare (MWR) programs, contracting, and numerous administrative duties.

There are several means by which base operations support could be provided to DLI, including:

- Continued support from within the Department of the Army;
- Contractual support with private sector entities under a BOS contract;
- Support agreements with local government; and
- Consolidation with the Naval Postgraduate School.

Because of economic and logistical factors, the base closure and realignment process has directed that the Department of Defense retain a portion of Fort Ord (referred to as the "Presidio of Monterey (POM) Annex"). By retaining the POM Annex, the Army can also retain a scaled down version of the support organization presently located at Fort Ord. This reduced organization can meet the future support requirements of DLI and the annex itself.

Another means in which this support could be provided is through Base Operations Support (BOS) contracts with the local economy. This, however, is not necessarily a comprehensive approach to complete base operations support. BOS contracts traditionally do not cover all functions found under base operations support. Furthermore, the success of BOS contracts at bases within the United States is questionable.

In addition, it may also be possible to turn to the local government for negotiated support agreements. However, use of local governmental support may be limited by laws and regulations and is not included in the scope of this study.

Another alternative calls for the consolidating support functions with the Naval Postgraduate School. Given the

preexisting and self-sufficient NPS organization in combination with the relatively small size of the remaining Army establishment, it is quite feasible to expand the NPS' base operations support organizations to provide support for both DLI and the POM Annex.

In all practicality, it is not likely that any single option would be the most effective support plan for DLI. Instead, a combination of these options may be more appropriate for comprehensive base operations support. A complete consolidation with the Navy or complete turnover to the private sector could be problematic. For instance, the Navy would be hampered by Army specific requirements, regulations, control systems, management information systems, procedures, instructions, and cultural norms that are not easily superimposed upon another service.

In light of the present fiscally constrained operating environment, it is important to discover the most cost effective means of doing business. Furthermore, since the enactment of the Base Closure and Realignment Act, many organizations have discovered that continued existence is virtually contingent upon efficient operations.¹ Although

¹ Public Law 101-510, November 5, 1990, Defense Base Closure and Realignment Act. This act requires the review of military bases for possible closure or realignment in an attempt to reduce defense expenditures. One of several factors used by the individual services and the BRAC Committee in identifying bases for closure or realignment is the local operating costs.

DLI successfully remained off of the base closure and realignment lists of 1991 and 1993, it will likely go under further scrutiny in 1995, during the final round of review required by the law. Therefore, implementing a fiscally wise support plan for DLI can not be overemphasized.

B. OBJECTIVES

This thesis will focus on one component of base operations support, the *facility support function*. Facility support is a critical part of a comprehensive plan to provide continued base operations support to DLI once Fort Ord is closed. In terms of cost, facility support is typically one of the most significant components of base operations support. Therefore, this limited study captures a significant portion of the total picture.

As briefly discussed above, there are several options available for providing support to DLI and the POM Annex. However, this study will incorporate only the two most likely options for facility support:

- Consolidating support operations under an expanded Naval Postgraduate School Public Works Department; and
- Maintaining an independent Department of Engineering and Housing.

These two options were chosen because they are the primary alternatives being pursued by DLI officials since Fort Ord's closure was announced. These options are the two most logical

means of accomplishing continued facility support for DLI and the POM Annex, given the limited experience and restrictiveness of the other options. Furthermore, the Base Closure and Realignment (BRAC) Committee has recommended that the Army consolidate with NPS for local facility support.²

Because there are economies of scale associated with facility support operations, consolidating local Army facility support with NPS's Public Works Department appears to be economically beneficial. We will investigate whether using a single organization to provide all facility support for the military establishments remaining on the Monterey Peninsula would be more efficient than multiple independent organizations.

The main objective of this thesis is to compare the costs of these two facility support options for DLI and the POM Annex. Further objectives include substantiating that economies of scale exist with empirical data, analyzing the costs and benefits for the consolidation option, and determining the overall impacts on facility support costs for NPS if consolidation is executed.

C. THE RESEARCH QUESTION

The primary research question of this thesis is: "can facility support functions for the Defense Language Institute

² The Monterey County Herald, 72nd yr., No.11, June 25, 1993, pg. A14.

(DLI) and the POM Annex be performed more economically by expanding the Naval Postgraduate School Public Works Department?" Additional issues to be addressed include:

- Existence of economies of scale;
- Organizational structures to meet changes in workload;
- Benefits/disadvantages to consolidation; and
- Impact on facility support costs for NPS and DLI.

D. SCOPE

In order to discover the most efficient means of providing facility support to the POM and the POM Annex, this study will compare the costs associated with the two options identified above: *consolidating all facility support requirements with NPS or using a separate Army facility support organization.* The costs will be developed based on the organizational requirements associated with each option as determined by the NPS Public Works Department and the Department of the Army (published in the United States Army Force Integration Support Activity (USAFISA) study of 1991).

For such a cost comparison to be valid, the two options must yield the same end product. In order to ensure the same end product, the specific facility support functions included in this study are limited. Differences in organizational structure and accounting records as well as the unavailability of certain data require us to limit the facility support functions to the following: *maintenance of real property,*

minor construction, utilities operation and maintenance, engineering and planning services, hazardous waste, and contracting for maintenance services.

In developing the cost comparison, our primary focus is on the resulting labor costs of each option. Currently, labor costs comprise nearly fifty percent of the total cost of the above listed facility support functions for both NPS and Fort Ord/DLI. Material, utility, and contract costs together make up the remainder. Therefore, a reduction in labor costs plays a major role in the overall cost effectiveness.

Because the use of facility support contracts is essentially a substitute for organizational labor, they are also of concern in this study. However, to the extent that the number and scope of these contracts are the same, we assume that their resulting costs (direct and indirect) will be the same for either organization.³ The costs of these contracts are considered to be differential only when they are used to a different extent by the Army or the Navy.⁴

In focusing on only the labor costs associated with both organizations, we assume that the material and public utility

³ For example, the number and scope of the facility support contracts for DLI (janitorial, refuse collection, and grounds maintenance) will be the same regardless of whether the Army or Navy organization is used.

⁴ Only in the case of family housing support is the use of facility support contracts significantly different. The proposed Army organization relies on contract labor to a much greater extent than the NPS organization, as will be identified later in the thesis.

costs would be the same for the Army or the Navy. Since these costs are more a function of location rather than organization, their exclusion from this study is reasonable.⁵

Because this is an analysis of facility support costs, the facilities to be supported must be identified. Several significant changes in the size and content of the remaining POM Annex have been proposed while this study was performed. The most recent change came from the Base Realignment and Closure (BRAC) Committee's recommendations. For the purposes of this study, the POM Annex is defined to be consistent with the BRAC Committee recommendations.

Under their recommendations, the POM Annex is limited to the Post Exchange (PX), the Commissary, one Child Care Center, and whatever the number of housing units deemed necessary by the remaining local military installations.⁶ Discussions with the NPS Public Works Officer revealed that approximately 1,203 housing units to be retained.

The manpower requirements of an expanded NPS public works organization or a separate and autonomous Army facility support organization are both based on providing support to DLI (located on the POM) and the POM Annex (as defined above). Furthermore, the scope of support is to remain on a status quo

⁵ One might argue, however, that the amount of material (thus material costs) is a function of the organization used. This point is brought out later in the thesis.

⁶ The Monterey County Herald, 72nd yr., No. 11, June 25, 1993 pg A1,A14.

level. No additions or subtractions to the overall support currently being provided to DLI are assumed. Although each organization will operate under their own standard procedures, the overall tasks to be performed under either option are assumed to be equivalent.

E. LIMITATIONS

Various obstacles were encountered that limit this study. These limiting factors are discussed in the following subsections.

1. Accounting Systems and Organizational Structures

Differences in Army and Navy accounting systems preclude directly comparing like products without converting data or rearranging categories into similar structures. It was necessary to determine which facility maintenance function was included in which code of the Army system. Fort Ord does not have a reimbursable system for off-station facility support services (such as performing maintenance at DLI) nor a working system for separating these costs from on-station costs (such as performing maintenance at Ft. Ord). The lack of this type of accounting prevented a detailed review of historical cost data.

Organizational structures also varied greatly, further limiting the detail of the analysis. The Navy facility support organizational structure is essentially self contained within one department, Public Works; the Army's is not. Under

the Army system, three department level organizations perform facility support type services: Logistics (DOL), Contracting (DOC), and Engineering and Housing (DEH).

2. Estimated Organizational Requirements

The Army organizational data used in this analysis was based upon the requirements published in the 1992 USAFISA study. While the Army estimates were validated by the USAFISA study team as accurate, they were based on the originally proposed POM Annex. This annex was substantially larger than the area recommended by the BRAC commission in 1993.

The Army has not since revised their organizational requirements to reflect this change in the POM Annex. To arrive at a new "estimate" that is consistent with the scope of facilities to be supported, we had to modify the Army facility support organization. Although we believe our approach in modifying the organizational requirements to be objective and accurate, it is only an estimate.

3. Level of Service

Actual levels of service for facility maintenance are not necessarily the same between the Army and Navy facility support organizations. Unfortunately, there was no maintenance data (backlog maintenance, annual inspection surveys, maintenance hours worked) to illuminate the methodology and procedures normally used by the DEH. The Deputy DEH director was uncooperative in accessing this

historical data despite repeated attempts to gather such information.

However, from the information available, it appears that the NPS Public Works Department generally provides a greater level of service as compared to their DEH counterparts. For example, the Navy organization seems to place much more emphasis on preventative maintenance than the Army organization.

Differences in the level of service have impacts on other associated facility support costs. As the Navy emphasizes preventative maintenance, its labor costs are inherently higher because of the additional personnel required to operate in this manner. However, this strategy can have an impact on other costs, such as reducing material and contract costs. Also, it can bring other intangible factors into the comparison, such as customer service and satisfaction.

Because of the difficulty in defining the differences in the level of service and quantifying their impact in the analysis, it is only noted that differences exist. Any impacts on cost or end product differentiation are not factored into the cost comparison.

F. DEFINITIONS AND ABBREVIATIONS

BOS: Base Operations Support
BRAC: Base Realignment and Closure
DEH: Department of Engineering and Housing (Army)
DLI: Defense Language Institute
DOD: Department of Defense
DRM: Department of Resource Management
FORSCOM: Forces Command (Army)
ISSA: Interservice Support Agreement
MWR: Morale Welfare and Recreation
NPS: Naval Postgraduate School
POM: Presidio of Monterey
PWD: Public Works Department (Navy)
PX: Post Exchange, (Army)
TRADOC: Training and Doctrine Command (Army)
USAFISA: United States Army Force Integration Support Activity

G. PREVIEW OF CHAPTERS

A brief description of the remaining chapters is provided below.

Chapter II provides background information regarding the Fort Ord-Defense Language Institute Base Operations Support relationship, funding process, ISSA, and the BRAC process and

its impacts to the military installations on the Monterey Peninsula. It also provides an overview of the Army and Navy facility support organizations. Chapter III discusses the methodology used in the data collection and analysis process. It identifies the procedures used in obtaining the necessary data and for making any estimates required to perform the cost analysis. Chapter IV presents the data collected and the illustrates the required estimations. Chapter V analyzes the results and provides conclusions and recommendations based upon them.

II. BACKGROUND

A. FORT ORD, DLI, NPS: BACKGROUND INFORMATION

1. Fort Ord

Fort Ord was established on the Monterey Peninsula in 1919. Located approximately 5 miles from Monterey, between the cities of Seaside and Marina, it was the home of the United States Army's Seventh Infantry Regiment (Light) until its recent decommissioning. As a part of the Base Realignment and Closure (BRAC) process, Fort Ord will be closed except for a relatively small portion to be renamed the Presidio of Monterey (POM) Annex.

Organizationally, Fort Ord falls within the Army's Forces Command (FORSCOM) from whom it receives the majority of its funding for both mission and base operations support. In 1992, Fort Ord maintained and operated a total of 18.1 million square feet of training, office, berthing, and other facility spaces on 28,500 acres of land.

2. The Defense Language Institute

The Defense language Institute opened in 1941 at Fort Snelling, Minnesota and relocated to its present location at the Presidio of Monterey (POM) in 1946. DLI currently provides instruction in 21 languages for all services and has an average yearly enrollment of 3,600 students.

Organizationally DLI falls within the Army Training and Doctrine Command (TRADOC) and receives its mission funding from this source. However, the POM itself is owned by FORSCOM. The POM area encompasses approximately 390 acres of land with approximately 1.7 million square feet of office, training, and housing space.

3. The Naval Postgraduate School

The Naval Postgraduate School (NPS) has operated on the Monterey peninsula since 1951, when it was relocated from the U.S. Naval Academy, Annapolis, Maryland. NPS provides graduate level instruction in various engineering, science, and management curriculums for approximately 1500 students from all U.S. services and numerous foreign military services.

NPS's major claimant is the Chief of Naval Operations (CNO). NPS receives its direct funding from this source. In addition to its direct funding, NPS also receives a significant amount of indirect funding (reimbursable). The majority of these funds are derived from research work; however, a portion is from tenant command reimbursement.

NPS provides its own base operations support from the various departments within its command structure. As of 1993, no support agreements exist between the Naval Postgraduate School and the Defense Language Institute or Fort Ord, with the exception of housing for some NPS military students and staff at Fort Ord.

B. BASE OPERATIONS SUPPORT RELATIONSHIPS

Fort Ord is presently tasked by the Department of the Army with providing Base Operational Support (BOS) for all Army facilities in the "local" area. These other installations include the Defense Language Institute (DLI) located at the Presidio of Monterey (POM), Fort Hunter Liggett (FHL) located approximately 100 miles south east of the Monterey Peninsula, and, to a limited degree, various Army Reserve sites in California and neighboring states.

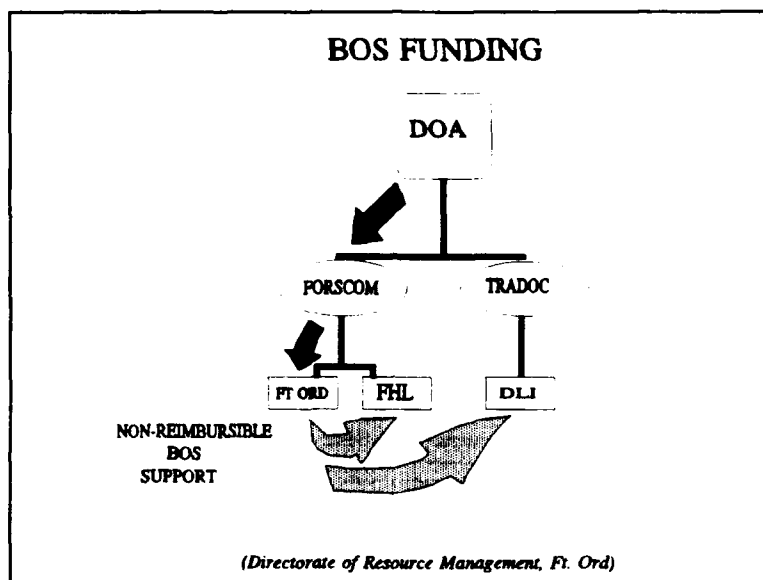
However, this study will concentrate only on the Defense Language Institute and Fort Ord. Support for the other commands (FHL and reserve areas) is to be transferred from Fort Ord to Fort Lewis, commencing FY 1994. Thus, their support requirements will no longer be an issue.

BOS is provided by numerous departments centralized on the Fort Ord Post. These departments include the Directorate of Engineering and Housing (DEH), Directorate of Contracting (DOC), the Directorate of Logistics (DOL), Directorate of Resource Management (DRM), Finance and Accounting Office (FAO), and the Directorate of Personnel And Community Affairs (DPCA).

C. BOS FUNDING CHANNELS

Because Fort Ord is tasked with supporting other installations, it is accordingly funded to do so. Until the closure of Fort Ord, FORSCOM provided Fort Ord with BOS

funding for supporting itself, Fort Hunter Liggett, and DLI. Even though DLI operates under a different claimant, TRADOC, it still received BOS on a non-reimbursable basis. Figure 2.1 illustrates the BOS funding channel and support provisions as discussed.



BOS Funding Channel
Figure 2.1

D. FORT ORD & DLI ISSA

Fort Ord and DLI have negotiated an Interservice Support Agreement (ISSA) for the Base Operations Support functions provided by Ft Ord to DLI.⁷ BOS, as defined in the ISSA, includes numerous items, from finance and accounting support

⁷ Inter-Service Support Agreement No. W62R65-274, between Commander, 7th Infantry Division Light/Fort Ord and Commandant, Defense Language Institute, 28 Nov. 1990.

to petroleum oil and lubricants. In terms of cost, one of the major functional areas of the ISSA is the maintenance and operation of DLI's facilities and grounds, or those functions that would be performed by a Public Works Department at a Naval installation.

An important point concerning the ISSA between these two commands is that Ft Ord has the discretion to make decisions affecting the level of support provided to DLI. Specifically, Fort Ord is required to provide, on a non-reimbursable basis, **only** that level of support it provides to itself. Therefore, the level of support provided from year to year could vary depending on the level of funding available or on the priorities of the Fort Ord Commanding General. As a result, one of the major complaints voiced by the Defense Language Institute is that it has very little control over what facility support it receives. Further, because of the differences in facilities, requirements, and priorities that are predominant between training commands and operational commands, DLI does not necessarily get the full support they would like.⁸

Facilities personnel at DLI have therefore suggested altering the existing arrangement to a reimbursable agreement. Instead of receiving non-reimbursable support from Fort Ord, the Department of the Army would provide BOS funding directly

⁸ Meeting with DLI Facility Manager, Mr. Jerry Abeda, 21 July 1993.

to TRADOC which in turn would fund DLI. It was thought that controlling their own dollars would inherently give them more control over what support they received. Nevertheless, attempts to implement this change were not successful.⁹

E. BASE CLOSURE AND REALIGNMENT (BRAC)

1. BRAC Summary

Because of the changing world threat situation and ever tightening federal budget constraints, the military's force structure is being reduced. Common sense dictates that any significant reduction in force structure would necessitate corresponding infrastructure reductions. Accordingly, the Defense Base Closure And Realignment Act of 1990 (Title XXIX of Public Law 101-510) was enacted to establish new procedures for closing or realigning military installations in the United States.

The act established an independent Defense Base Realignment and Closure (BRAC) Commission to review and amend the Secretary of Defense's base closure recommendations in accordance with published selection criteria. This commission is charged with reviewing the Secretary's base closure and realignment recommendations for three subsequent calendar years: 1991, 1993, and 1995.

⁹ Meeting DLI Facility Manager, Mr. Jerry Abeda, 21 July 1993.

Upon receipt of the Secretary's list (no later than April 15 of the respective year), the BRAC Commission reviews the recommendations and conducts public hearings. The Commission then must report their findings, conclusions, and recommendations to the President by July 1.

The President is to approve or disapprove the Commission's recommendations and forward them to Congress by July 15. If approved by the President, Congress then has 45 days to accept or reject the commission's recommendations, in their entirety. If not approved by the President, the Commission may revise the list in whole or in part. Revised recommendations must be approved by the President and transmitted to Congress by August 15 of the year concerned. If approval is not attained and transmitted to Congress prior to 1 September, the process for that year is terminated.

2. BRAC Impacts on Fort Ord and DLI

a. Fort Ord

In April 1991, at the conclusion of the first round of the base closure review cycle, Fort Ord had been designated for closure. As the BRAC process proceeded, Fort Ord remained on the closure list and was ultimately approved for closure. As a part of this decision, the Seventh Infantry Regiment, (Light) was to be relocated to Fort Lewis, Washington (but subsequently has been decommissioned).

A significant issue that arose from the decision to close Fort Ord concerned how to meet support requirements for the Defense Language Institute operating at the Presidio of Monterey (POM). Because of the limited housing available at the POM, Fort Ord provided additional family housing. Also, DLI relied upon the Post Exchange, Commissary, various MWR activities, and numerous DEH and DOL facilities that were all located on Fort Ord. Therefore, the BRAC commission decided to retain a portion of Fort Ord to support DLI. The remaining portion of Fort Ord was designated as the POM Annex.

The POM Annex was also justified by the fact that Fort Ord provides support to various services and personnel beyond those currently attached to Fort Ord, the Seventh Infantry, or DLI. For example, the Post Exchange (PX) and Commissary facilities also support Navy and Coast Guard personnel stationed in the area as well as numerous military retirees.

Additionally, the Fort Ord Housing provides family housing services for 200-300 Navy and Coast Guard personnel. This demand will continue after Fort Ord's closure. Housing functions themselves provide an operational savings to the government of up to \$500 per unit per month, compared to the

average rents of housing off station.¹⁰ This significant savings makes their continuation highly desirable.

Several proposals were brought forward regarding the POM Annex area necessary to support DLI, the Coast Guard, NPS, and others after FY 1995. Initial plans retained approximately 2100 acres and 1.8 million square feet of office and work space along with 1400 housing units and various Morale Welfare and Recreation (MWR) assets.

In November and December of 1992, survey teams from the U.S. Army Force Integration Support Activity (USAFISA) and the Office of the Chief of Engineers validated the support requirements for this proposed annex. The USAFISA team also derived the manning organization necessary to support the Defense Language Institute and the Presidio of Monterey Annex after Fort Ord's closure (including a caretaker force to maintain excess areas and facilities until properly disposed of). Several variations or options were included in this study because the actual annex size had not been finalized. Depending on which of the various options was chosen, the report concluded that between 25 to 40 million dollars would be required to provide Base Operations Support to the annex and DLI.

¹⁰ Based on the Navy's estimates of NPS's La Mesa Housing which are quite similar in all respects to Fort Ord's family housing.

b. The Defense Language Institute

The Defense Language Institute was impacted by the second round of the base closure process in early 1993. The Secretary of Defense recommended closing the POM and relocating DLI. However, as the BRAC process proceeded, the Commission reversed this position and recommended that DLI operate at the Presidio of Monterey. Fundamental to this decision was the requirement to reduce overhead costs associated with the operation of DLI at the POM.¹¹

In order to reduce overhead costs, the Commission recommended reducing the size and content of the POM Annex (formerly Fort Ord). These recommendations were as follows:

- Retain only enough military housing required to support area DOD installations (NPS, Coast Guard, and DLI);
- The POM Annex should include only housing, one child care center, the Commissary and Post Exchange; and
- Fort Ord Golf Courses should be disposed of.

These recommendations, recently approved by the President and Congress, significantly change the level of base operations support required for DLI and the POM Annex. In addition to these recommendations, the Commission also recommended that DLI's facility maintenance functions be

¹¹ The Monterey County Herald, 72nd yr., No. 11, June 25, 1993, pg A1, A14.

performed by the Navy.¹² Although this thesis began well before the BRAC commission reviewed the DLI issues and made any decisions concerning them, their recommendation for consolidation gave further impetus for this study.

F. FACILITY SUPPORT ORGANIZATIONS

As stated before, this study is concerned with only the facility support component of base operations support (BOS). Both the Army and the Navy have internal organizations that provide this service to meet their individual needs.

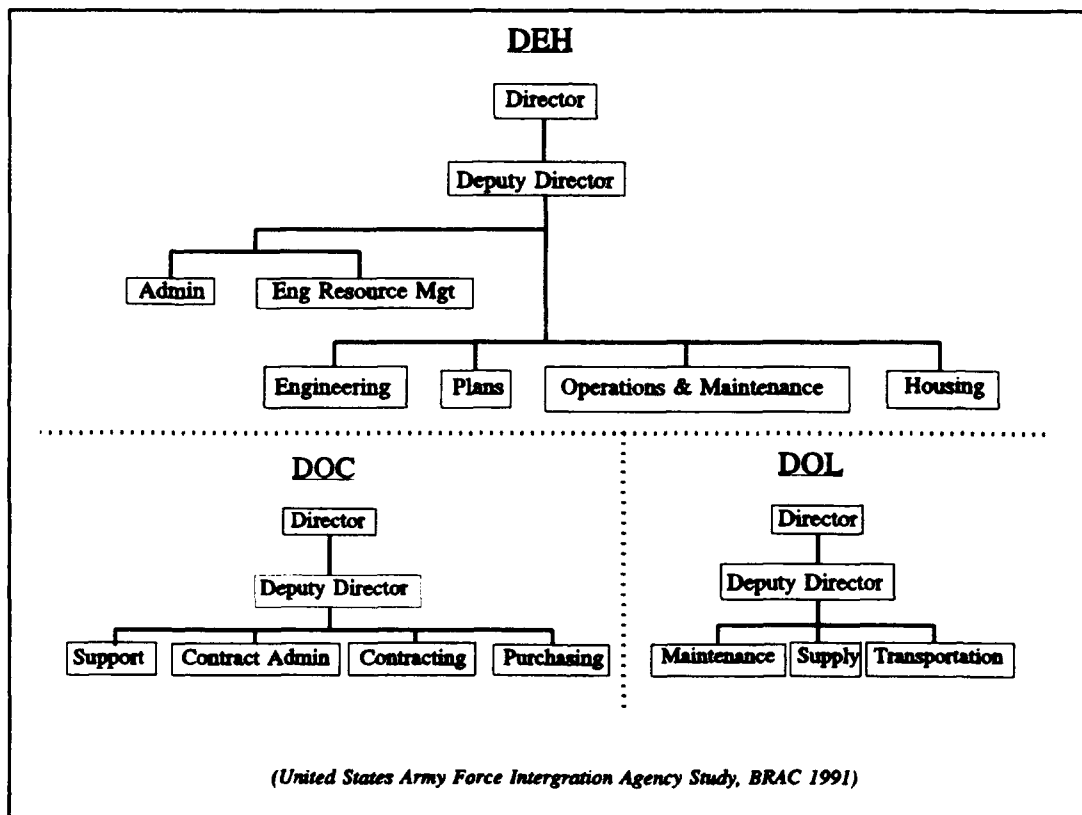
Naval installations perform all of their facility support functions under a single organization, Public Works. NPS has its own internal Public Works Department which is responsible for facility support. On the other hand, the Army performs facility support functions under a variety of Departments. The following subsections provide a more indepth description of the Army and Navy organizations.

1. Army Organizational Structure

The Army provides facility support through various Directorates within its organization. While the majority of facility maintenance functions are performed by the Directorate of Engineering and Housing (DEH), the Directorate of Logistics (DOL) and Directorate of Contracting (DOC) also

¹² Whether or not this recommendation is binding upon the Army is subject to disagreement. To date no direction has been given nor any progress made in implementing this recommendation.

provide services in this functional area. Figure 2.2 illustrates the Army's facility support organization. Currently, all of these organizations are centralized on Fort Ord with the exception of small on-site offices/facilities.



Army Facility Support Organization
Figure 2.2

In preparing for the post-closure period, the Army has proposed a modified organization to meet the reduced support

requirements.¹³ The modified facility support organization maintains essentially the same structure but its elements are significantly reduced in size.

A brief description and breakdown of each department is provided in the subsections below.

a. Directorate of Engineering and Housing (DEH)

As stated earlier, DEH is the central body responsible for an installation's facility maintenance and operations. The proposed DEH organization is composed of several branches as described below.

(1) *Office of the Director.* This office plans, directs, supervises, and coordinates all facility engineering activities for Fort Ord, the Presidio of Monterey (DLI), and Fort Hunter Liggett (FHL). This office is equivalent to the Navy's Public Works Officer and his/her immediate assistants.

(2) *Administrative Section.* This section's function is to coordinate and direct DEH's administrative tasks of DEH. Its tasks are primarily comprised of general office services, such as correspondence, filing, report generation and submission. It additionally provides departmental mail service, processes travel requests, and records maintenance.

¹³ The proposed Army BOS organization for the post-BRAC period is published in the 1991 USAFISA report.

(3) *Engineer Resource Management Division.* This division is comprised of 5 internal branches: Budget, Work Management, Management Engineering Systems, Energy Management, and the Self Help Store.

The *Budget branch* is responsible for the planning programming, budgeting, and executing accounts within the *Operations and Maintenance, Army (OMA)* and *Army Family Housing (AFH)* appropriations.

The *Work Management branch* operates the service call desk and is responsible for reviewing, evaluating, and estimating all facilities engineering work requests. They prioritize and coordinate work requests, schedule cyclical inspections to identify facility maintenance work requirements, and maintain facility records.

The *Management Engineering Systems branch* is responsible for operating and maintaining computer systems and computer applications for the DEH staff. This branch also performs industrial engineering studies.

The *Energy Management branch* negotiates, prepares, and administers utility purchases and sales contracts. It also maintains liaison with state and municipal bodies regarding utilities and operates energy monitoring and control systems.

The *Self Help Store branch* operates the self-help program for family housing, troop billet residents and the civilian work force. It receives, reviews, and

approves requests for material support for self-help projects. Upon approval, it also provides the materials for troop support projects of less than \$1000. Additionally, this branch includes the Furnishings Management Office which is responsible for the inventory control and assignment of furnishings and appliances for family housing and troop billet residents.

(4) *Engineer Division.* This division is broken down into three branches: Design, Contracts, and Services. The Design and Contracts branches provide engineer and contract execution support for Fort Ord, DLI and FHL, including full design and execution of engineering projects to repair and upgrade installation facilities. The Services branch is responsible for overseeing all service contracts performed on the installation.

(5) *Plans Division.* This division is comprised of three branches; Master Plans, Real Property, and Environmental Branch. Responsibilities of this division include master planning functions (long range facility planning), property record maintenance, and environmental compliance activities for all area Army installations.

(6) *Housing Division.* This division's mission is to centrally manage all housing requirements. Its tasking includes budgeting, administration, management, and operation

of the installation's housing facilities. This division also had two personnel assigned to barracks management.

(7) *Operations and Maintenance Division.* This division's responsibility is to plan, organize and execute repair, operations, maintenance, and construction work on improved and unimproved real property facilities. The Operations and Maintenance Division is composed of 3 main branches to include the Repair branch, the Utilities branch, and the Supply branch.

b. Directorate of Logistics (DOL)

This department performs traditional supply and support functions, many of which are similar to the Navy's Supply Department. However, under its Maintenance Division, DOL also provides for an element of facility support. The maintenance and repair of vehicles (the motor pool) is part of the transportation function of facility support and in the Navy organization is fulfilled by public works.

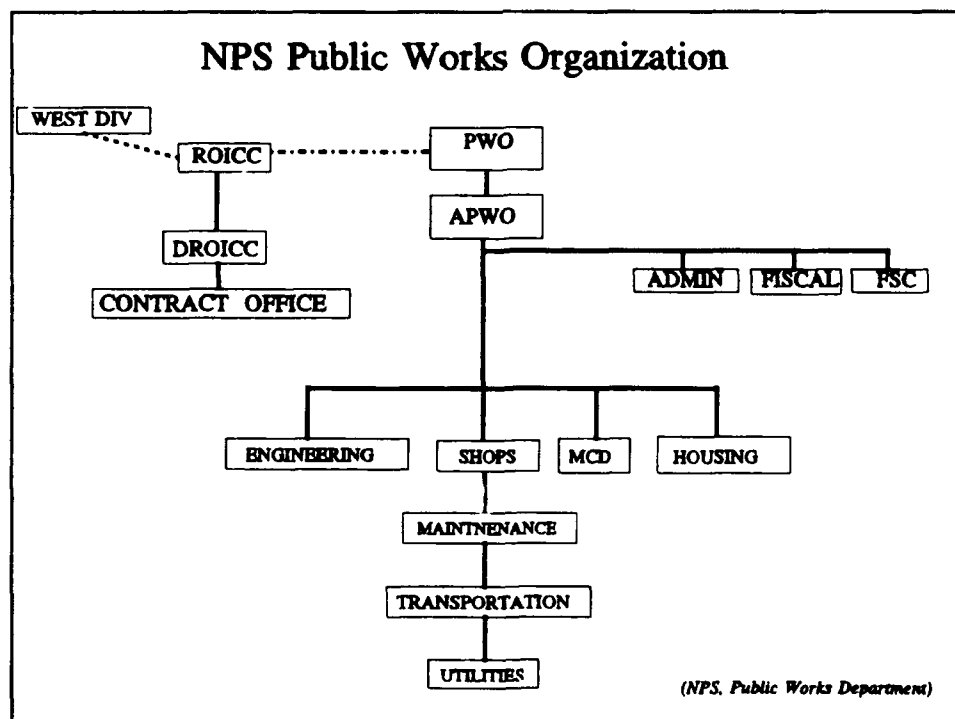
c. Directorate of Contracting

This department is responsible for providing contract administration actions for procuring supplies, services, construction, maintenance, repair, and utilities. It also performs commercial activity cost comparison studies, convenes source selection boards, and coordinates objectives related to federal procurement programs. DOL is divided into

four branches; Administrative Support, Purchasing, Contracting, and Contract Administration. DOL provides contracting services for many functions and a portion of their work is attributable to facility maintenance functions.

2. Navy Organizational Structure

Facility maintenance at the Naval Post Graduate School is accomplished by its Public Works Department. Although the Public Works Department must interact with the Supply Department for purchasing actions and the Comptroller shop for budget concerns, it is essentially autonomous in performing the facility maintenance function. An organizational chart for the NPS Public Works Department is illustrated in Figure 2.3 below.



NPS Public Works Department
Figure 2.3

The NPS public works department is comprised of 7 separate divisions, each of which contribute to facility maintenance and operations. These divisions include: *Administration*, *Budgeting*, *Engineering*, *Facility Support Contracting*, *Housing*, *Maintenance Control*, and the *Shops* (the actual laborers). A brief description of the components of the public works organization is provided in following subsections.

a. Administration

The Administration Division provides general administrative support to the Public Works Officer and Assistant Public Works Officer as well as other division directors and staff as required. It coordinates the completion and submission of the numerous internal and external departmental reporting requirements, maintains the departmental files, and prepares departmental correspondence.

b. Budgeting

The Budgeting Division provides the fiscal support required by the Department. It maintains internal accounting records for departmental spending, coordinates and submits the Department's annual budget requirements to the Comptroller Department, and liaisons with the Supply and Comptroller Departments concerning fiscal matters.

c. Engineering

This division provides design and engineering support for the installation. Specifically, it performs

special project design and review, prepares military construction (MILCON) requests and justifications, prepares contract specifications, maintains facility plans and drawings, and performs long range planning. The Engineering division is also responsible for providing professional input and advise to support maintenance, repair, and construction projects.

d. Housing

The Housing Division administers and operates the installation's Family Housing facilities. Specific tasks include: quarters assignment and termination, coordination of maintenance and repairs, budgeting and fiscal matters, inspection of housing contract performance, and the completion of various reporting requirements.

e. Maintenance Control

The Maintenance Control Division (MCD) prepares work orders for station maintenance, repair, and small construction or alteration type projects. It operates the trouble desk to which facility problems are called. MCD also coordinates, schedules, and prioritizes work orders for Shop personnel. Additionally, this division coordinates the station's Annual Inspection Summary (AIS) which identifies the condition of all facilities and grounds for reporting requirements to the Major Claimant as well as for generating a maintenance backlog list.

f. Shops

This division includes a combination of maintenance, utility, and transportation personnel who operate and perform routine maintenance/repairs for all facilities, utility systems, and transportation equipment. In essence, these are the individuals who perform the actual facility maintenance and operations (the direct labor personnel). While combined into a single division at NPS, these three functional areas are typically separated into individual divisions at larger installations.

g. Facility Support Contracting

The Facility Support Contracting (FSC) division performs the contracting actions necessary to provide facility service contracts to NPS. Current NPS service contracts cover such tasks as janitorial services, grounds maintenance, and refuse collection. This division writes, advertises, awards and administers all Public Works service contracts with technical assistance from MCD, Engineering, and sometimes the ROICC office.

h. Other Support Activities

Other activities also support the Public Works Department. The Resident Officer In Charge of Construction (ROICC), a tenant activity at NPS, provides construction contract support to NPS. Although a tenant activity, the NPS Public Works Officer serves as the ROICC (dual hatted).

Nevertheless, the daily operation of this office is delegated to his deputy within the ROICC office. The PWO-ROICC "dual-hating" is intended to ensure goal congruence between the station and its tenant ROICC office.

One last organization which also provides support to the NPS PWD is the Naval Facilities Engineering Field Division, Western Division , (WESTDIV), located in San Bruno, CA. This activity, when requested, assists in miscellaneous projects and engineering studies to support the Public Works Department on a reimbursable or non-reimbursable basis.

III. METHODOLOGY

A. OVERVIEW

In this chapter we will discuss the data collected and the methodology used to analyze the data. The data can be broken down into three main areas, as listed below.

- Army/Navy FY 92 facility support costs;
- The USAFISA validated facility support organization proposed by the Army to provide continued facility support to DLI and the POM Annex as defined by the 1991 BRAC proposal; and
- The Navy's facility support organization as proposed by the NPS PWD to fulfill the facility support requirements of DLI and the POM Annex as defined under the recent 1993 BRAC proposal.

The historical cost data (FY 92) for each of the concerned installations provide a base line to illustrate the relative cost difference between using a single, large organization to support several bases (Fort Ord's facility support organization) and using a relatively small, independent organization to support a small base (NPS Public Works Department). Assuming there are returns to scale, using a large organization to support several installations will be cheaper than using small independent organizations at each installation.

The two proposed facility support organizations provide the fundamental data for forecasting and comparing their cost effectiveness in supporting the DLI/POM Annex. Prior to comparing the two proposed organizations, the Army's USAFISA validated organization will be revised to reflect the decrease in size and content of the POM Annex under BRAC 1993. Then the resulting differential costs of the two organizations will be estimated and compared to identify which proposal is more cost efficient.

In comparing either the historical costs or estimated future costs of facility support under the two organizations, the product received from each organization must be equivalent to make the cost comparisons meaningful. In developing the cost comparison, we attempt to look through the accounting systems and organizational structures to ensure equitable comparison of the associated costs.

Additionally, we note that the scope of work to be performed for DLI/POM Annex is the same under each organization. However, this does not account for the differences in quality, reliability, and timeliness of the work performed. Both the Army and the Navy have their own way of operating; their individual standards, strategies, and norms. Quantifying these factors would require an indepth analysis of Army/Navy facility life cycle cost data to determine which organization's procedures are more cost

effective. Such an analysis is beyond the scope of this thesis and thus we only identify the issue.

B. HISTORICAL COSTS

In order to appreciate the relative costs of facility support under the Army and Navy organizations as they currently exist, the historical costs of both services were analyzed. Fiscal year 1992 data was utilized because it provided the most recent cost data covering an entire year. Thus, it reflects relatively current operational efficiency.

As stated in Chapter I, this study assumes that material, public utility, and certain service contract costs are non-differential costs. Thus, the only costs of concern for analyzing cost effectiveness are labor and differential service contract costs. However, the FY 1992 data obtained from Fort Ord did not separate labor, contract, material, and utility costs. Therefore the historical data presented in this study for both the Army and the Navy represents the total cost of facility support.

1. Army Historical Data

As stated previously, Fort Ord has provided facility support to Defense Language Institute (DLI) and Fort Hunter Liggett (FHL), in addition to servicing its own needs. The facility support services are provided as a part of the total Base Operations Support (BOS) for these three Army commands. To understand how facility maintenance costs are distributed

within the Army accounting system, the list of BOS activity codes was reviewed.

BOS Activity codes are listed in Table 3.1 by type of activity. These codes are further broken down into sub-codes. For example, Utility Operations, code J, includes sub-codes J0-J6 and JA-JH. Each sub code identifies a more specific activity functional area.¹⁴ By reviewing the description of each code and sub-code, the BOS activity codes which involve the facility support functions were identified.

Of the 22 BOS functions, seven contain elements identified with facility support. Those facility support codes are *Army Family Housing*, *Maintenance of Non-Tactical Equipment*, *Operation of Utilities*, *Maintenance and Repair of Real Property*, *Minor Construction*, *Engineering Support*, and *Contract Operations* (shaded in Table 3.1). Only five of these activity codes, however, are exclusively facility maintenance functions; the remaining two include only a small percentage of facility maintenance tasks. The two areas with only limited facility maintenance functions are *Maintenance of Non-Tactical equipment* (B) and *Contracting* (W).

Data from the two non-homogeneous areas could not be separated into facility maintenance and non-maintenance costs. Therefore, only those activity areas which are totally devoted to facility maintenance tasks are included in this study.

¹⁴ AR 37-100-93, Financial Administration, ARMY MANAGEMENT STRUCTURE (AMS), 1 July 1992.

TABLE 3.1
ARMY BOS ACTIVITY ACCOUNTING CODES

CODE	FUNCTION
19x0	Housing
722892	TISA
B	Installation Supply Operations
C	Maintenance of Non-Tactical Equipment
D	Transportation Services
E	Laundry and Dry Cleaning
F	Army Food Service Programs
G	Personnel Support
H	Unaccompanied Personnel Housing
J	Operation of Utilities
K	Maintenance and Repair of Real Property
L	Minor Construction
M	Engineering Support
N	Command Element/Special Staff/HQ Commandant
P	Automation
Q	Reserves
S	Community and Morale Support Activities
T	Preservation of Order
U	Resource Management Operations
V	Plans and Training
W	Contract Operations
Y	Records Management

(Source: Directorate of Resource Management, DLI)

The two services deleted from this study, the maintenance of vehicles/equipment and contract administration, will not impact any conclusions of this thesis.

In the case of the *Non-Tactical Equipment Maintenance*, the associated Navy vehicular costs were also deleted. Similarly, the Navy's ROICC office costs, which are equivalent to the Army's Contract Operations, were also deleted. Furthermore, both of these functions are relatively small compared to the other facility support functions. This mitigates any possible impacts to the overall analysis.

The Army facility support cost for a given fiscal year will be calculated by summing the remaining facility maintenance code elements. Once the historical costs are compiled, they will be used for making cost comparisons based on organizational size. The costs of Army facility support will be reviewed at both the overall Army level (Fort Ord, DLI, FHL) and for DLI separately using the cost data obtained from Fort Ord and DLI.

2. Navy Historical Data

The Navy's historical facility support costs were obtained directly from specific *Sub-Activity-Group* (SAG) codes from prior year budgets. The SAG codes which comprise facility support funding are shown in Table 3.2.

All portions of each SAG are dedicated to facility support functions. Therefore, no transformation is required.

However, SAG FD, Engineering support, includes the school's fire department. This is not a facility support function provided under the Army organization. Therefore, it is not included in our scope. The costs associated with the fire department were removed prior to performing any cost comparisons.

TABLE 3.2
NAVY FACILITY SUPPORT ACCOUNTING CODES

SAG	Description
FA	Maintenance of Real Property
FB	Minor Construction
FC	Utilities
FD	Engineering Support
FR	Transportation
FT	Hazardous Materials
--	Navy Family Housing

(Source: NPS Comptroller)

The historical cost comparison only considers Navy SAG codes FA, FB, FC, FD (as edited), and Navy Family Housing. These categories directly correspond with the facility support functions included in the Army cost figures.

3. Cost Comparison Methods

In order to compare the historical cost of facility support at the relevant military installations, a unit costing measure will be used. Because there are separate Congressional Appropriations for family housing and base

operations, these two will be analyzed separately. The unit cost base used for family housing is *number of housing units* while the unit cost base for installation facilities is *square feet of facility space*. These allocation bases provide the average cost associated with operating and maintaining the respective facilities.

Using these historical unit costs, the facility support costs of the various installations can be compared. *All other factors being equal*, we expect that the cost per square foot and cost per housing unit for the Army will be substantially lower than for the Navy given the vast difference in organizational size and area of responsibility. This expectation is consistent with returns to scale in facility support organization.

However, *all other factors* are not equal and this will affect the costs of providing facility support. The type of facilities on the installations, the age of the facilities, and their condition are all factors that impact facility support costs. These factors must be considered when making any cost comparisons.

Moreover, the level of service provided by the individual facility support organizations has a significant impact on labor costs. As the level of service increases, more labor hours are required. Data was collected to determine the level of facility maintenance support routinely provided by each service. Interviews with knowledgeable Army

and Navy personnel provided several insights which indicate differences in service levels. These differences must be considered when performing cost comparisons.

a. Navy Level of Support

Discussions were held with the NPS Public Works Officer and Shops Division Director to determine the level of services provided at the Naval Postgraduate School. In general, the Navy performs a range of facility support tasks for shore activities through both in-house and contractor provided services. The main thrust of the Navy program is developing long and short range plans for completing maintenance and repair services. These plans include preventative maintenance programs through standing job orders. The Navy believes that preventive maintenance and pre-breakdown maintenance/repair significantly reduces long term facility maintenance costs.

The Maintenance Control Division (MCD) is at the forefront of this process. MCD performs an Annual Inspection Summary (AIS) which categorizes each area of the base by cost account code. It identifies and prioritizes the required maintenance and repairs. MCD also performs routine planning and estimating functions for the maintenance, repair, and preventative maintenance tasks.

Facility Support Contracting plans and schedules services performed by commercial activities. Service

contracts are used for tasks that are more economically provided through private sources. Current NPS service contracts include janitorial service, refuse collection, and grounds maintenance contracts. NPS also contracts with Pacific Gas and Electric for high voltage electrical and gas line maintenance on the main distribution lines for these utilities. This is accomplished through a usage based utility surcharge.

In the janitorial contract, NPS contracts for full services, meaning it does not use military or Navy civilian employees to perform this function in any office spaces, classrooms, or common areas within the barracks. The refuse collection and grounds maintenance contracts are also essentially full service contracts but are augmented to a degree by shops division personnel.

In summary, NPS attempts to provide facility support services with emphasis on preventative and pre-breakdown maintenance and repairs. These services are provided using both in-house personnel and commercial activities.

b. Army Level of Support

Fort Ord DEH personnel were initially contacted to determine what functions and level of support were provided by the Army organization. Unfortunately, it was not possible to conduct any interviews with either the DEH Office of the

Director or other divisions as requested. Therefore, discussions were held with the DLI Facilities Manager. This individual is responsible for coordinating Fort Ord maintenance support at DLI. Therefore he is qualified to provide information on this topic.

According to the DLI Facilities Manager, self-help plays a large role in the Army maintenance program. Generally speaking, the Army provides supplies and tools for occupants to perform routine maintenance and upkeep. As an example, barracks' rooms are painted by the occupant before transferring out. Barracks personnel also perform most janitorial services in both private rooms and common areas within the barracks. In family housing, residents often perform routine maintenance functions ranging anywhere from replacing a washer in a leaking faucet to repairing or replacing toilets. Military personnel are also tasked with grounds maintenance duties. Military and civilian employees perform a portion of the janitorial duties in offices and classrooms.

Performing these duties using military and civilian employees (non facility support personnel), reduces the labor costs associated with facility support.

Maintenance performed by DEH Operations and Maintenance division personnel is normally on a breakdown basis. Generally, service is not provided for routine maintenance activities unless the facility or equipment is no

longer functioning. Essentially only ongoing/reoccurring tasks such as water treatment are accomplished on a regular basis.

Preventative maintenance is not performed on a regular basis. A lack of preventative maintenance is documented in the USAFISA study. This study attributed the high back log of maintenance work requests to the lack of a good preventative maintenance program.

Funding cuts over recent years are partly responsible for the relatively low level of facility maintenance service. The funding reductions have required the Garrison Commander to decide what receives highest priority, mission/training or facility support.¹⁵

C. DETERMINING ORGANIZATIONAL COSTS

The following sections discuss the methodology used to estimate organizational costs of both the Army's and the Navy's proposals. Both proposals are designed to provide essentially the same tasks and level of service. Regardless of which proposal is used, it is assumed that the same material and public utility costs will be incurred. Therefore, the only differential costs are those associated with each organization's labor requirements and use of service

¹⁵ Meeting with Mr. Jack Gafford, Directorate of Resource Management, Ft Ord, 18 August 1993.

contracts. Only these differential costs are of concern in comparing the proposals' cost effectiveness.

1. Service Contract Costs

The number and scope of service contracts to be used by both organizations are essentially the same for installation support. They basically consist of janitorial, refuse collection, and grounds maintenance. The costs of these contracts are geographic location dependent and would vary little regardless of whether the Army or the Navy employed them. Therefore, the costs of installation service contracts are not considered differential costs and were omitted from this study.

On the other hand, housing service contracts are used to a significantly different degree under the two organizational proposals. The Army organization is designed to rely on contract labor to provide much of the housing maintenance while the Navy organization is designed to use very little contract labor. Therefore, the costs of housing service contracts are considered differential costs and must be accounted for in this cost comparison.

In order to account for the differences in housing service contract costs, we will estimate the contract cost associated with each organization based on the actual FY 1992 housing contract costs.

2. Army Organizational Labor Costs

The Army, in planning for support required by the Presidio of Monterey (POM), DLI, and other facilities remaining after Fort Ord closes in 1995, requested the U.S. Army Force Integration Support Activity (USAFISA) to complete a study. This study was based on the requirements for providing BOS services to DLI and remaining organizations located upon Fort Ord (the POM Annex) on a status quo basis. Generally speaking, most departments providing BOS services would remain after the post's closure; however, on a smaller scale. Between 30-50 percent of pre-closure BOS personnel would remain depending on which of several options was chosen.

The organizational structure and direct labor manhour requirements validated by the USAFISA survey team served as a starting point for estimating the cost of the Army organization. However, the POM Annex was reduced significantly in size and content under the 1993 BRAC review. Thus, this baseline needed to be reduced to reflect the reduced area of responsibility. The Army has not published a revised manpower proposal and so the required modifications could only be forecasted. The following technique was used to forecast the organization's likely size.

a. Army Direct Labor & Direct Labor Supervision

Historical records will be used to determine actual direct manhours exhausted for facility support at DLI and the

annex portions of Fort Ord as defined by BRAC 1991. This historical data is found in the USAFISA study. The direct manhour requirements for the newly defined annex are adjusted in proportion to the reduction in facility square footage. The total number of direct labor employees will be based on the revised labor hour requirements.

Direct labor supervision for the new baseline will be calculated using the *direct labor to supervision* ratio identified by the USAFISA team. For example, if the USAFISA study indicates that one supervisor is necessary for every 6 direct labor personnel the same 6 to 1 ratio is assumed for the new organization. Similarly, the upper level supervisor requirements will be forecasted by the *lower level supervisors to higher level supervisors* ratio indicated in the USAFISA study.

b. Army Indirect/Overhead Labor

Indirect and overhead manpower requirements were reduced in proportion to the reduction in facility area. However, there are certain fixed components that cannot be reduced within a relevant range of output (facility support). Positions in the original USAFISA approved organization which are fixed will be identified. Only the variable positions will be reduced. In determining which positions are fixed, the following criteria will be used:

- The division directors and one administrative assistant per director are fixed. These positions remain constant regardless of the downsized POM Annex;
- Within the Engineering Division, one engineer is required for each of the four basic disciplines (general, civil, mechanical, electrical). Each of these disciplines are required because of the specific technical expertise required; and
- Within the Engineering Resource Management Division, the Work Management Branch requires one planner/estimator versed in each specific discipline (mechanical, structural, electrical). Again, this is due to the specific expertise required in each area.

The total organizational requirements will be estimated by adding the fixed positions to the revised number of variable positions. Then salaries will be assigned to the various positions to estimate the overall organization labor cost. Because salary assignment data was not available from the Army's Civilian Personnel Office, a means to estimate the salaries was required. This study uses the average salary of the current DEH organization. This provides cost data that reflects the relative salary structure of an Army facility support organization.

3. Navy Organizational Labor Cost

The NPS Public Works Department developed several proposals for providing facility support to DLI/POM Annex. Each proposal was initiated because of the changing requirements dictated by the current dynamic environment. The

final proposal (to date) was based on the 1993 BRAC recommendations regarding the content and size of the POM Annex. Therefore, it did not require any modification. This final proposal also was designed under the premise that the tasks and level of service currently being performed at DLI/POM Annex would be provided by the Navy.

The basic proposal listed the additional manpower requirements necessary to support the Army installations. The overall labor cost will be determined by assigning salaries associated with each of the organization's positions and compiling them.

As before, an average salary will be used. However, *average salaries per division or branch* will be used for the Navy organization instead of an organization-wide average. Because there will be a significant portion of the organizational labor costs allocated between the Army and the Navy, it is important to ensure that the cost data reflects the salary differences of the various positions more accurately.

To allocate the labor costs between the Army and the Navy, the organization was reviewed to determine the division of labor between NPS and DLI/POM Annex. The Public Works Officer indicated that NPS used a supplemental approach were possible in determining the additional manpower/skill positions required for the DLI/POM Annex. A supplemental

approach enabled the Navy to capture any possible economies of scale resulting from the increased organizational size.

For example, DLI requires an elevator mechanic. However, an additional mechanic was not included because the tasking could be met by the NPS elevator mechanic. Also, DLI/POM Annex has a requirement for an electrical engineer, mechanical engineer, and civil engineer. However, only two additional engineers are added because the technical specialty requirements can be met with NPS's existing engineering staff.

With the supplemental approach, various employees are "shared" by the two installations. This creates a cost accounting problem; *how much of each shared person's salary is attributable to each installation?* It is easy to trace individuals who are a direct cost (work only at/for the Army or the Navy). However, tracing individuals who constitute a common cost (perform work for both DLI and NPS) presents a difficulty.

It is not feasible for us to forecast the amount of time each "shared" individual will spend performing work for each of the installations. Therefore, an allocation method will be used to estimate actual costs attributable to each of the respective installations. Adding the direct and the allocated costs associated for each installation will yield the total labor costs attributable to the Army and the Navy under the Navy's proposal.

4. Comparison of Costs

Once the labor cost estimates for both the Army's proposed organization and the Navy's proposed organization are determined, they will be compared in Chapter V. The labor costs will be added to the estimated housing service contract costs to arrive at a total differential for each organization. The resulting costs of each organization will be summarized and the variances analyzed. Additional discussion and analysis will be performed to determine possible recommendations for action and further study.

IV. DATA PRESENTATION

A. HISTORICAL FACILITY SUPPORT COSTS

This section presents the historical costs for fiscal year 1992 for both the Army (Fort Ord) and the Navy (NPS). The total overall costs of facility support (labor, material, utilities, and service contracts) will be used to determine the cost per square foot of base/post facility space and the cost per housing unit.

1. Army Historical Data

Base operations support (BOS) services for the Army at Fort Ord, DLI, and Fort Hunter Liggett totaled over \$90 million in FY 92. Of this total, over \$45 million was obligated for facility support and family housing services. A detailed breakdown of BOS service costs is shown in figure 4.1.

The cost of facility support is determined by adding only those categories that are related to facility support. As discussed in Chapter III, *Contract Administration* (W) and *Transportation Equipment Maintenance* (C) are not included because many non-facility support functions are within these categories. *Maintenance of Real Property* (MRP) and *Minor Construction* were not available separately, but are combined

under one account. The related facility support costs are summarized in Table 4.2.

TABLE 4.1
ARMY FY 1992 BASE OPERATIONS SUPPORT COSTS

Code	Activity	Cost (\$K)
B	Supply	4,735.7
C	Maint Non-Tactical Equip	6,029.3
D	Transportation	4,436.8
E	Laundry	853.0
F	Food Service	6,350.5
G	Personnel Support	4,190.6
H	Bachelor Housing	740.9
J	Utilities	11,986.0
K/L	MRP/Minor Construction	7,149.6
M	Other Engineering Support	8,361.7
N	HQ Garrison Support	2,809.7
P	ADP	1,705.1
Q	Reserves	199.2
S	Community Support	2,619.0
T	Preservation of Order	4,525.7
U	Rescue Management	3,577.3
W	Contracting	1,517.8
Y	Records Management	1,072.7
19X0	Army Family Housing	18,504.0
	Total	91,364.5

(Source: Directorate of Resource Management, Fort Ord)

TABLE 4.2
ARMY FY 1992 FACILITY SUPPORT COSTS

Code	Activity	Cost (\$k)
J	Utilities	11,986.0
K/L	MRP/Minor Construction	7,149.6
M	Other Engineering Support	8,361.7
	SubTotal	27,497.3
19X0	Army Family Housing	18,504.0
	Total	46,001.3

(Source: TABLE 4.1)

Determining the cost per square foot of installation facility support and the cost per unit for housing operations and maintenance requires data on the square feet of installation facilities and number of housing units in the area of responsibility. This information is shown in Table 4.3.

TABLE 4.3
ARMY FACILITY SUPPORT AREA OF RESPONSIBILITY

Installation Facilities	11.3 msf
Army Family Housing	5943 units

(Source: DRM, Fort Ord)

Dividing facility support costs by total square footage yields cost per square foot. The cost per housing unit was similarly calculated. Unit costs for each are shown in Table 4.4. The unit costs shown in Table 4.4 represent the average total facility support costs for all the locations serviced by Fort Ord.

TABLE 4.4
ARMY OVERALL FY 1992 UNIT COSTS

Installation Support	\$2.43 per sq ft per year
Army Family Housing	\$3,114 per unit per year

2. Defense Language Institute

Costs for all BOS services, including facility support functions, are reported annually to DLI by Fort Ord. These reported costs were reviewed to determine how Fort Ord costs were allocated to DLI. DLI officials were not aware of the allocation method used in reporting these costs. The facility support cost data Fort Ord reported to DLI in FY 92 and the facility square footage/housing unit data is used to determine the unit costs. This information is provided in Tables 4.5 and 4.6.

TABLE 4.5
FY 1992 DLI FACILITY SUPPORT COST DATA

Code	Activity	Cost (\$K)
J	Utilities	1797.9
K	MRP	1037.3
L	Minor Construction	35.1
M	Other Engineering Support	1238.0
	Sub Total	4108.3
19X0	Army Family Housing	274.2
	Total	4382.5

(Source: DRM, Defense Language Institute)

TABLE 4.6
DLI FACILITY DATA

Installation Facilities	1.7 msf
Army Family Housing	93 units

(Source: DRM, Ft. Ord)

As above, the unit cost per square foot and per housing unit are calculated to arrive at the average cost of facility support and housing operation and maintenance at DLI. The results are shown in Table 4.7.

TABLE 4.7
FY 1992 DLI UNIT COSTS

Installation Support	\$2.42 per sq ft per year
Army Family Housing	\$2,948 per unit per year

Considering the similarity between the costs in Tables 4.7 and 4.4, it appears that Fort Ord allocates its facility support costs by square footage for installation support and number of housing units for housing operation and maintenance.

3. Navy Historical Costs

NPS' facility support costs were obtained in the same manner used for the Army installations. Facility support related SAG's and their respective costs for FY 92 were obtained from the NPS Comptroller division and are presented in Table 4.8. NPS' specific facility data is provided in Table 4.9.

TABLE 4.8
FY 1992 NPS FACILITY SUPPORT COSTS

SAG	Activity	Cost (\$K)
FA	MRP	5,056
FB	Minor Construction	165
FC	Utilities	1,541
FT	Hazardous Waste	187
FD	Engineering Support	1,935
Sub Total		8,884
	Navy Family Housing	3,666
Total		12,550

(NPS Comptroller)

TABLE 4.9
NPS FACILITY DATA

Facility Spaces	1.4 msf
Navy Family Housing	877 units

(NPS Public Works Department)

As with the Army, the unit facility support costs are calculated to obtain NPS's average cost per square foot of installation facilities and per housing unit. The resulting unit costs are summarized in Table 4.10.

TABLE 4.10
FY 1992 NPS UNIT COSTS

Installation Maintenance	\$6.35 per sq ft per year
Navy Family Housing	\$4,180 per unit per year

This completes the FY 1992 average facility support costs for both the local Army and Navy installations. The estimated costs of the proposed Army and Navy organizations will be calculated in the following two sections.

B. ARMY ESTIMATED COSTS

As the next step, costs were estimated for an Army organization to provide facility support to DLI and the POM Annex after Fort Ord closes. The scope of support is limited to the area defined in the recent 1993 BRAC report. As discussed previously, the only Army organizational data available was based on the 1991 BRAC intentions. Therefore, the organizational requirements are to be reduced in accordance with the methods described in Chapter III. Once the original organization is modified, the associated facility support costs are estimated. The following sections present the data, forecasted modifications, and resulting estimated costs as broken down by the organizational components.

1. Operations and Maintenance Division

The original validated organization's Operations and Maintenance Division includes 61 positions, as presented in Table 4.10. These divisions are organized under three branches: the Repairs Branch, the Utilities Branch, and the POM Branch. These positions are mostly direct labor, but there are some overhead/supervisory positions.

TABLE 4.10
OPERATIONS AND MAINTENANCE DIVISION

Division Chief				1	
Secretary				1	
Repair Branch		Utility Branch		POM Branch	
Branch Chief	1	Branch Chief	1	Branch Chief	1
Mechanical Foreman	1	Boiler Shop Foreman	1	Secretary	1
Maintenance Mech/Plumber	6	Boiler Operator	1	Foreman	1
A/C Mechanic	3	Pipefitter	1	Boiler Mech	2
Struct. Rpr. Foreman	1	Welder	1	Electrician	1
Maintenance Mechanic	1	Sheetmetal	2	Pipefitter	1
Glazier	1	Utilities Foreman	1	Equipment Operator	1
Locksmith	1	Maint. Mech	3	A/C Mech	1
Carpenter	2	Water Plant Operator	1	Maint Mech	4
Painter	1	Sewage Plant Operator	1	Warehouse Laborer	1
Civil Works Foreman	1	Electrical Foreman	1	Subtotal	14
Equip. Operator	5	Electricians	2		
Pest Control Foreman	1	High Voltage Tech	3		
Pest Controller	1	Subtotal	19		
Subtotal	26				

Total Personnel	61
-----------------	----

(USAFISA Report)

The designated fixed positions are the division director, two secretaries (one each at DLI and the POM Annex), and one warehouse worker located at the POM. These positions are shaded in the table. The director and secretarial positions perform top level supervision and provide the division's general administrative requirements. Two secretarial positions are designated fixed because support operations are conducted at two separate locations. Similarly, the warehouse worker is fixed because this position provides the minimum on-site supply support required for the separate facilities. Table 4.11 summarizes the fixed and variable positions.

TABLE 4.11
OPERATIONS AND MAINTENANCE DIVISION
FIXED AND VARIABLE LABOR SUMMARY

Fixed	4
Variable (Direct Labor)	47
Variable (Supervisor I)	7
Variable (Supervisor II)	3
Total	61

(Source: TABLE 4.12)

The Operations and Maintenance Division contains all of the direct labor positions (i.e., the plumbers, carpenters, welders, etc.). The number of these positions is directly related to the amount and type of facilities supported. On the other hand, the variable supervisory positions in the

Operations and Maintenance Division are directly related to the number of direct labor employees. Thus, these two categories of personnel are inter-dependent and the relationship between supervisors and direct labor needs to be determined.

A relationship between workers and supervisors can be inferred from the original organization validated by the USAFISA study. It is assumed that these ratios are fairly constant across various organization sizes because they reflect the span of control which supervisors can effectively manage. The ratio of *direct labor employees to level one supervisors* and the ratio of *level one supervisors to level two supervisors* in the USAFISA organization are summarized in Table 4.12.

TABLE 4.12
LABOR/SUPERVISOR RATIOS

Type	Number	Sup (II) : Sup (I) Ratio	Sup (I) : Labor Ratio
Supervisor II	3	1 : 1.75	1 : 6.71
Supervisor I	7		
Direct Labor	47		

(USAFISA Report)

Assuming that this ratio remains fairly constant for all levels of direct labor staffing, an organization would require approximately one level one supervisor for every 7 direct labor employees and 1 level two supervisor for every 2

level one supervisors. These ratios are applied in the modification of the Army organization.

The next step is to determine the change in the actual facilities of the POM/POM Annex. The 1991 BRAC results indicated that 3.3 million square feet of installation facilities and 1400 housing units would remain. The 1993 BRAC process reduced these amounts to 1.9 million square feet of installation facilities and 1203 housing units.

The modified organization decreases the direct, supervisory, and support personnel required to maintain the reduced area. However, the manpower requirements cannot be reduced by the corresponding percent reduction in square footage. There are fixed positions and other relationships that don't depend on facility size. The Operation and Maintenance Division also provides some support to housing. The effort spent on housing must be allocated on a housing unit basis.

In order to approximate the number of personnel required by the new 1993 BRAC baseline, direct manhour requirements are estimated. The USAFISA report estimated the direct manhours required to support the facilities in the 1991 version of the POM and POM Annex. The direct manhour requirements are separated into three portions; DLI, Family Housing, and the POM Annex. Table 4.13 summarizes this data.

TABLE 4.13
1991 USAFISA Validated Manhour Requirements

Area	Facilities	Manhours
POM	1.7 msf	26,590
POM Annex	1.8 msf	25,335
Army Family Housing	1400 Units	22,780
Total		74,705

(USAFISA Report)

The direct manhour estimates can be modified to reflect the reduced area requirements. The manhour requirements are assumed to be proportional to the square footage of installation facilities and the number of housing units.

The direct labor manhour requirement for housing is calculated as follows:

$$\frac{1203 \text{ units}}{1400 \text{ units}} \times 22,780 \text{ hours} = 19,575 \text{ hours}$$

The 1993 BRAC process did not affect the size or content of DLI (POM). Accordingly, the direct labor manhour estimates provided in the USAFISA report will remain as published. On the other hand, the 1993 BRAC report drastically reduces the POM Annex. Essentially, all Fort Ord closes except for one child care center, the Commissary, and the Post Exchange facilities. The approximate square footage

of installation facilities shrinks to less than 200,000. The direct labor manhour requirement for the POM Annex is reduced correspondingly :

$$\frac{0.2 \text{ msf}}{1.8 \text{ msf}} \times 25,335 \text{ hours} = 2,815 \text{ hours}$$

Total direct labor hours required for the new 1993 BRAC baseline are shown in Table 4.14. Converting to the new baseline reduces manhour requirements from 74,705 hours to 48,980 hours (a 35 percent reduction).

TABLE 4.14
NEW 1993 BRAC BASELINE MANHOURL REQUIREMENTS

Area	Facilities	Manhours
POM	1.7 msf	26,590
POM Annex	1.8 msf	2,815
Army Family Housing	1400 Units	19,575
Total		48,980

The estimated manhours and corresponding number of employees published in the USAFISA report indicates the *effective manhours per year* for the Army organization. The effective manhours per employee as calculated from the USAFISA report is shown in Table 4.15.

TABLE 4.15
EFFECTIVE MANHOURL PER EMPLOYEE

USAFISA Direct Manhours	Direct Employees	Effective Hours per Employee
74,705	47	1590

(Source: USAFISA Report)

The effective (or productive) hours per employee is defined as those hours in which the employee is performing work. The remaining time is necessary for attending safety meetings, travel time, administrative time, and employee leave. Using the productive hours per employee in the USAFISA study assumes that this figure approximates historical requirements.

The next step is to determine direct labor requirements under the new baseline. The number of direct labor employees needed under the revised organization is estimated by dividing the estimated direct labor manhours required to support the revised POM Annex and DLI by the efficient hours per employee. The calculation is as follows:

$$\frac{48,980 \text{ hours}}{1,590 \text{ hours}} = 30.8$$

Rounding to the nearest whole number, 31 direct labor employees are required to meet the support workload.

The rest of the division can be determined using the supervisory ratios previously developed. A ratio of 1 level one supervisor to every 6.71 direct labor employees yields a requirement of 4.6 level one supervisors. Rounding to the nearest whole number implies five level one supervisors are required. Similarly, the ratio of one level two supervisor to every 1.75 level one supervisors implies 2.8 level two

supervisors are required. Again, rounding to the nearest whole number makes the requirement three.

The Operations and Maintenance Division as modified to correspond to the reduced area of responsibility is summarized in Table 4.16.

TABLE 4.16
MODIFIED ARMY OPERATIONS AND MAINTENANCE DIVISION

Fixed	4
Variable (Direct Labor)	31
Variable (Supervisor I)	5
Variable (Supervisor II)	3
Total	43

2. Supply Branch (O&M Division)

The Operation and Maintenance division also contains a supply branch. This branch provides material procurement support to the Operations and Maintenance Division. It also coordinates warehousing and materials handling for facility maintenance. To modify the Supply Branch, the designated fixed positions remain constant while the variable positions are reduced in proportion to the reduced direct labor hours determined above. A summary of the original USAFISA positions is shown in Table 4.17.

The work load in the supply branch is considered to be variable with the exception of the branch chief. The branch

as broken into its fixed and variable components is illustrated in Table 4.18.

TABLE 4.17
SUPPLY BRANCH, USAFISA VALIDATED POSITIONS

O&M Supply Branch	Employees
Supply Branch Chief	1
Property Control Supervisor	1
Property Control Clerk	1
Item Manager	2
Accounts Clerk	1
Warehouse Foreman	1
Warehouse Laborer	3
Total	10

(Source: USAFISA Report)

TABLE 4.18
SUPPLY BRANCH, FIXED AND VARIABLE COMPONENTS

USAFISA Supply Branch	Positions
Fixed	1
Variable	9
Total	10

(Source: Table 4.17)

Using direct labor hours as our allocation base for variable positions, and given the 35 percent reduction determined previously, the nine variable branch positions are reduced to 5.85.

$$0.65 \times 9 \text{ variable positions} = 5.85 \text{ positions}$$

Rounding to the nearest whole number yields a requirement for six people. The total number of supply branch personnel required under the new baseline organization totals is summarized in Table 4.19.

TABLE 4.19
MODIFIED ARMY SUPPLY BRANCH (O&M DIVISION)

Revised Supply Branch	Positions
Fixed	1
Variable	6
Total	7

The same modification technique will be used for the remaining divisions. Fixed positions will be identified and held constant. Variable positions are reduced in proportion to the reduction in their respective driving factor.

3. Family Housing Management

The original USAFISA Housing Management Division is illustrated in Table 4.20.

TABLE 4.20
HOUSING MANAGEMENT DIVISION, USAFISA VALIDATED POSITIONS

Housing Management	Employees
Division Chief	1
Secretary	1
Family Housing Officers	10
Total	12

(Source: USAFISA Report)

The housing director and secretarial positions are considered fixed. The number of family housing officers depends on the number of housing units. Thus, the variable positions are a function of housing units. A summary of fixed and variable positions for the housing division is shown in Table 4.21.

TABLE 4.21
HOUSING MGT. DIVISION, FIXED AND VARIABLE COMPONENTS

Housing Management Division	Positions
Fixed	2
Variable	10
Total	12

(Source: TABLE 4.20)

4. DEH Office of the Director

USAFISA validated positions for the office of the director are shown in Table 4.22.

TABLE 4.22
OFFICE OF THE DIRECTOR, USAFISA VALIDATED POSITIONS

DEH Office of the Director	Employees
Director	1
Secretary	1
Total	2

(Source: USAFISA Report)

Both the director and his direct administrative assistant (secretary) are required regardless of the area of responsibility. Therefore, both are fixed.

The fixed and variable positions within this division are summarized in Table 4.23.

TABLE 4.23
DEH OFFICE OF THE DIRECTOR, FIXED AND VARIABLE COMPONENTS

DEH Office of the Director	Positions
Fixed	2
Variable	0
Total	2

(Source: TABLE 4.22)

5. Administrative Division

USAFISA validated positions for the Administrative division are shown in Table 4.24.

TABLE 4.24
ADMINISTRATIVE DIVISION, USAFISA VALIDATED POSITIONS

Administrative Division	Employees
Administrative Officer	1
Management Assistant	1
Mail Clerk/Typist	1
Clerk Typist	1
Total	4

(Source: USAFISA Report)

The administrative officer and the clerk/typist are designated as fixed positions. An administrative officer is required regardless of organizational size. Because of the various paperwork requirements, the clerk/typist is also considered a fixed component. The two remaining positions depend on organizational size.

The fixed and variable positions within the administrative department are summarized in Table 4.25.

TABLE 4.25
ADMINISTRATIVE DIVISION, FIXED AND VARIABLE COMPONENTS

Administrative Division	Positions
Fixed	2
Variable	2
Total	4

(Source: TABLE 4.24)

6. Engineering and Resource Management Division (ERM)

The Engineering Resource Management Division contains 6 separate branches that perform a variety of functions, from work management to self help management. The division includes 29 positions that were validated under the USAFISA study. The division components are illustrated in Table 4.26. In determining the fixed and variable positions of this division, each branch is analyzed separately.

TABLE 4.26
ERM DIVISION, USAFISA VALIDATED POSITIONS

Engineer Resource Mgt. Division	Employees
Office of the Chief	
Division Chief	1
Secretary	1
Budget Branch	
Budget Analyst	2
Budget Assistants	2
Work Management Branch	
Branch Supervisor	1
Estimator	3
Engineering Technician	2
Work Order Clerk	2
Material Coordinator	1
Dispatcher	1
Engineering Clerk	1
Mgt Engineering Systems Branch	
Industrial Engineer	1
Systems Analyst	1
QA/Data Transcriber	1
Computer Operator	1
Energy Branch	
Energy Supervisor	1
Energy Assistant	1
Self Help Mgt Branch	
Supply Technician	1
Warehouse Laborer	1
Property Clerk	1
Equip/Small Engine Repairman	1
Warehouse/Store worker	1
Storeworker/Screen Shop	1
Total	29

(Source: USAFISA Report)

a. ERM, Office of the Chief

This office includes the division director and one secretarial support position. Given the standard requirement for the director and his administrative support person, both of these positions are designated as fixed. The fixed and variable components are summarized in Table 4.27.

TABLE 4.27
ERM OFFICE OF THE CHIEF, FIXED AND VARIABLE COMPONENTS

ERM Office of the Chief	Positions
Fixed	2
Variable	0
Total	2

(Source: TABLE 4.26)

b. ERM, Budget Branch

ERM's Budget Branch includes two budget analysts and two budget assistants. The budget analyst functions are split between the *Operations and Maintenance* appropriation and the *Family Housing* appropriation functions. Because the number of housing units is reduced by a relatively small amount, the requirement for a separate family housing budget analyst remains. The other budget analyst is required to handle the O&M budget functions which exist regardless of the reduction in the area of responsibility.

The remaining positions vary with the organization's activity. They are therefore designated as

variable positions and depend on the size (square feet) of the facilities supported by the DEH Operations and Maintenance Division. The fixed and variable components of the Budget Branch are summarized in Table 4.28.

TABLE 4.28
ERM BUDGET BRANCH, FIXED AND VARIABLE COMPONENTS

ERM Budget Branch	Positions
Fixed	2
Variable	2
Total	4

(Source: TABLE 4.26)

c. ERM, Work Management Branch

The work management branch includes 11 positions and is responsible for coordinating and planning work requirements. Four positions in this branch are designated as fixed. Project estimators are normally split into a minimum of three categories; mechanical, structural and electrical. An independently operating planning and estimating branch requires specific knowledge and expertise in each discipline. The three existing estimators in this branch are therefore categorized as fixed. Additionally, there is a standard requirement for a branch supervisor. This position is also classified as fixed.

The remaining positions are designated as variable because they depend on the amount of work performed by the

Operations and Maintenance Division. The fixed and variable positions within the Work Management Branch are summarized in Table 4.29.

TABLE 4.29
ERM WORK MGT. BRANCH, FIXED AND VARIABLE COMPONENTS

ERM Work Management Branch	Positions
Fixed	4
Variable	7
Total	11

(Source: TABLE 4.26)

d. ERM, Management Engineering Systems Branch

The Management Engineering Branch provides DEH with computer support and performs studies as required. No supervisor positions were validated by the USAFISA survey. Therefore, all these positions depend on the work load. All positions in this branch are considered variable.

The fixed and variable positions within the Management Engineering Systems Branch are summarized in Table 4.30.

TABLE 4.30
ERM MGT AND ENGINEERING SYSTEMS BRANCH,
FIXED AND VARIABLE COMPONENTS

ERM Mgt and Eng. Systems Branch	Positions
Fixed	0
Variable	4
Total	4

(Source: TABLE 4.26)

e. ERM, Energy Management Branch

The USAFISA survey validated two positions within the energy branch to purchase utilities and liaison with regulators. One of the two positions is a supervisor. This supervisor has responsibility over the Management and Engineering Systems Branch as well. Given that position's supervisory role and that the installation has utility and regulatory requirements regardless of size, one position is categorized as fixed. The additional position is designated as a variable dependent on installation size.

The fixed and variable positions within the Energy Branch are summarized in Table 4.31.

TABLE 4.31
ERM ENERGY BRANCH, FIXED AND VARIABLE COMPONENTS

ERM Energy Branch	Positions
Fixed	1
Variable	1
Total	2

(Source: TABLE 4.26)

f. ERM, Self Help Branch

The self help store is a key component in the Army management organization for facility maintenance. The Army performs a significant portion of minor maintenance and repair work by self help procedures. Therefore, a comprehensive self help store is required.

The USAFISA survey validated 6 positions for the self help store under the original USAFISA baseline. The store includes one supervisor and 5 additional storeroom positions. As a supervisor is required regardless of the size of the self help division, the supervisory position is fixed. The remaining positions are variable and depend on the square footage of facility spaces supported with self help materials.

The fixed and variable positions within the Self Help Branch are summarized in Table 4.32.

TABLE 4.32
ERM SELF HELP BRANCH, FIXED AND VARIABLE COMPONENTS

ERM Self Help Mgt Branch	Positions
Fixed	1
Variable	5
Total	6

(Source: TABLE 4.26)

7. Engineer Division

The USAFISA validated position requirements for the DEH Engineering Branch were not broken down into specific positions, but rather into general areas. Justification for the fixed and variable components is based on the Navy's organizational structure for an Engineering division. The USAFISA validated positions are illustrated in Table 4.33.

TABLE 4.33
ENGINEER DIVISION, USAFISA VALIDATED POSITIONS

Engineer Division	Employees
Chief	1
Secretary	1
Design Branch	6
Structural Branch	7
Support Branch	6
Total	21

(Source: USAFISA Report)

a. Division Staff

As per the standard requirement for division management, supervision, and administration, the division director and secretary are designated as fixed positions. This is summarized in Table 4.34.

TABLE 4.34
ENGINEER DIVISION HEAD, FIXED AND VARIABLE POSITIONS

Engineering Division Head	Positions
Fixed	2
Variable	0
Total	2

(Source: TABLE 4.33)

b. Design and Structural Branches

In a Navy organization, the engineering division includes three main elements: the division director, engineers and engineering technicians. The rationale for fixed positions

is similar to that of the ERM Work Management Branch. One engineer qualified in each "standard" engineering discipline is required in order to function autonomously. Thus, one Mechanical, one Electrical, one Civil, and one General Engineer position is fixed.

The remaining positions within this branch are considered variable. They depend on the workload generated. The fixed and variable positions within the Design and Structural Branches of the Engineering Division are summarized in Table 4.35.

TABLE 4.35
ENGINEERING DESIGN AND STRUCTURAL BRANCHES,
FIXED AND VARIABLE POSITIONS

Engineering Design & Structural Branch	Positions
Fixed	4
Variable	9
Total	13

(Source: TABLE 4.33)

c. Support Branch

The Support Branch performs functions similar to the Navy's Facilities Support Contract Division. These include contract document preparation and DEH contract administration. Using the Navy organization as a guide, four positions perform unique tasks. These positions are considered fixed. These four fixed positions are the division

director, a contract specialist, a contract representative, and a Quality Assurance Inspector. The division director position might possibly be combined with the contract specialist position in a small organization. However, it is included as a separate fixed position in this case because of the organization's expected size.

The remaining positions are considered variable and depend on the workload generated. The fixed and variable positions within the Support Branch of the Engineering Division are summarized in Table 4.36.

TABLE 4.36
ENGINEERING SUPPORT BRANCH, FIXED AND VARIABLE COMPONENTS

Engineering Support Branch	Positions
Fixed	4
Variable	2
Total	6

(Source: TABLE 4.33)

8. Plans Division

The DEH Plans division is broken down into three branches; the Realty, Master Planning, and Environmental Branch. The positions as validated under the USAFISA study are illustrated in Table 4.37. Each branch of this division is analyzed separately in order to determine which positions are fixed and which are variable.

TABLE 4.37
PLANS DIVISION, USAFISA VALIDATED POSITIONS

Plans Division	Employees
Real Property Branch	
Realty Specialist	1
Master Plans Branch	
Master Planner	1
Environmental Branch	
Supervisor	1
Clerk	1
Env. Project Specialist	4
Total	8

(Source: USAFISA Report)

a. Realty and Master Planning Branches

The realty specialist within the Army organization maintains property records. These tasks are required in any standard Army organization, but a specialized position is not necessary. Therefore this position is variable.

Similarly, the Master Planning Branch does not require a specialized individual who performs only master planning. This responsibility could be delegated to the Engineering Division. This position is considered variable.

The fixed and variable components of the combined Realty and Master Planning Branches are summarized in Table 4.38.

TABLE 4.38
REALITY AND MASTER PLANNING BRANCHES,
FIXED AND VARIABLE COMPONENTS

Realty and Master Planning Branches	Positions
Fixed	0
Variable	2
Total	2

(Source: TABLE 4.37)

b. Environmental Branch

The Environmental Branch supervisor and the secretary positions are fixed in accordance with the standard supervisory and administrative requirements. The remaining environmental technician positions are variable and depend on the size of the supported station's size (total facility square feet).

The fixed and variable components of the Environmental Branch are summarized in Table 4.39.

TABLE 4.39
ENVIRONMENTAL BRANCH, FIXED AND VARIABLE COMPONENTS

Environmental Branch	Positions
Fixed	2
Variable	4
Total	6

(Source TABLE 4.37)

9. Allocation Cost Summary

Table 4.40 summarizes the fixed and variable components of all divisions and branches within the Department of Engineering and Housing with the exception of the Operations and Maintenance area. The table also indicates the parameter on which the variable positions are based on.

TABLE 4.40
SUMMARY OF ARMY OVERHEAD/INDIRECT LABOR,
FIXED AND VARIABLE COMPONENTS

	Fixed	Variable	Total	Variable Factor
Housing Management	2	10	12	Housing Units
Office of Director	2	0	2	N/A
Administrative Branch	2	2	4	Sq.Ft. (non Hsg)
Eng. Resource Mgt				
Office of Chief	2	0	2	N/A
Budget Branch	2	2	4	Sq.Ft. (non Hsg)
Work Management Branch	4	7	11	Direct Labor Hours
Mgt&Engineering Systems Branch	0	4	4	Direct Labor Hours
Energy Branch	1	1	2	Total Sq.Ft.
Self Help Branch	1	5	6	Total Sq.Ft.
Engineering				
Director	2	0	2	N/A
Design/Struct. Branch	4	9	13	Total Sq.FT.
Support Branch	4	2	6	Total Sq.FT.
Plans Division				
Realty/Master	0	2	2	Total Sq.FT.
Environmental	2	4	6	Total Sq.FT.
Total	28	48	76	

The percentage change between the original baseline and the new 1993 BRAC baseline for each of the allocation parameters of the variable positions is shown in Table 4.41.

TABLE 4.41
CHANGE IN BASELINE ALLOCATIONS OF VARIABLE POSITIONS

	Original	New Baseline	Percent
Housing Units	1400 units	1203 units	86%
Non-Housing SF	3.3 msf	1.9 msf	58%
Total SF	5.9 msf	4.1 msf	69%
DL Hours	74,705 hrs	48,980 hrs	65%

(Source: DRM, Ft Ord and PWD, NPS)

The next step in forecasting the new 1993 BRAC baseline Army organization is to determine the number of variable positions required based on the allocation base for each division or branch. As an example the number of Family Housing Management Division's variable positions is allocated by the number of housing units managed. As the number of units changed from 1400 under the original baseline to 1203 under the new baseline, the number of variable positions is reduced by the same factor, 1203/1400 (or 86 percent), as shown below.

$$0.86 \times 10 \text{ variable positions} = 8.6 \text{ positions}$$

Rounding to the nearest whole number yields a modified requirement of nine variable positions in the Family Housing Management Division in order to operate 1203 units. The remaining variable positions are modified in the same manner based on their respective allocation factor.

A summary of the entire modified organization for the reduced 1993 BRAC baseline is provided in Table 4.42. This summary includes those positions in the Operations and Maintenance Division which were calculated previously. The estimated number of positions required in an Army facility support organization is 112. However, a portion of this organization's labor will be spent on housing functions. This falls under the separate Family Housing Appropriation and therefore must be identified.

To do this, positions were identified that only provide support to **housing**. These include the Family Housing Management Division and one budget analyst from within the ERM Budget Branch, or a total of 12 positions. Next, positions which only support **non-housing** or installation facilities were identified. These positions include the Office of the Director, Administrative Division, ERM Office of the Chief, and ERM Budget Branch (less the one budget analyst previously identified), a total of 9 positions.

TABLE 4.42
SUMMARY MODIFIED ARMY FACILITY SUPPORT ORGANIZATION
1993 BRAC BASELINE REQUIREMENTS

	Fixed	Variable	Total
Operations and Maintenance	5	45	50
Housing	2	9	11
Office of Director	2	0	2
Administrative Branch	2	1	3
ERM			
Office of Chief	2	0	2
Budget Branch	2	1	3
Work Management Branch	4	5	9
Mgt&Engineering Systems Branch	0	3	3
Energy Branch	1	1	2
Self Help Branch	1	3	4
Engineering			
Director	2	0	2
Design/Struct. Branch	4	6	10
Support Branch	4	1	5
Plans Division			
Realty/Master	0	1	1
Environmental	2	3	5
Total	33	79	112

The remaining positions are allocated according to the appropriate allocation parameter, i.e., square footage or direct labor hours. For example, the 50 positions in the Operations and Maintenance Division must be allocated between housing and installation facility functions. The allocation

factor for this division is direct labor hours. As determined in a previous section, housing maintenance requires 19,575 manhours of support from the Operations and Maintenance Division. This division also provides 29,405 hours of direct labor support to installation facility maintenance. The division positions are allocated by the resulting direct labor hour proportions as illustrated below.

$$\frac{19,575 \text{ hrs}}{19,575 \text{ hrs} + 29,405 \text{ hrs}} = 40\%$$

$$50 \text{ positions} \times 40\% = 20 \text{ positions}$$

The resulting percentages based on the allocation parameters for housing and installation maintenance areas are provided in Table 4.43.

TABLE 4.43
REDUCTION FACTORS

Allocation Factor	Housing	Base Maintenance
Direct Labor	40%	60%
Square Feet	46%	54%

(Source: TABLE 4.41)

Applying these percentages to the various divisions and branches that provide labor for both housing and installation facility functions yields labor allocations as illustrated in Table 4.44.

TABLE 4.44
HOUSING/INSTALLATION LABOR ALLOCATION

Division/Branch	Housing	Installation	Total	Allocation Factor
Operations and Maintenance	20	30	50	DL hours
Housing Mgt.	11	0	11	N/A
Office of Dir.	0	2	2	N/A
Admin. Branch	0	3	3	N/A
ERM				
Office of Chief	0	2	2	N/A
Budget Branch	1	2	3	by position
Work Mgt Branch	3.6	5.4	9	DL hours
Eng Sys Branch	1.2	1.8	3	DL hours
Energy Branch	.9	1.1	2	Total SqFt
Self Help Branch	1.8	2.2	4	Total SqFt
Engineering				
Director	.9	1.1	2	Total SqFt
Design/Struct Branch	4.6	5.4	10	Total SqFt
Support Branch	2.3	2.7	5	Total SqFt
Plans				
Realty/Master	.5	.5	1	Total SqFt
Environmental	2.3	2.7	5	Total SqFt
Total	50.1	61.9	112	

The final step is to determine the labor costs associated with the Army organization. As discussed in Chapter III, the average cost per DEH employee will be used to transform the labor requirements to dollar costs. The Average salary of \$37,000 per DEH employee was provided by the Army Resource Management Department.¹⁶ Multiplying this figure by the labor requirements as determined above yields an estimate of the total labor costs associated with the Army facility support organization. Table 4.45 provides the results.

TABLE 4.45
ARMY ORGANIZATIONAL LABOR COST

	Positions	Labor Cost
Housing	50.1	\$1.854 million
Base Maintenance	61.9	\$2.290 million
Total	112	\$4.144 million

C. PROPOSED NPS PWD ORGANIZATION

The most recently proposed NPS organization for expanded facility maintenance and utility operation is presented in Table 4.46. This organization is sized to provide facility

¹⁶ Meeting with Mr. Jack Gaffard, Directorate of Resource Management, Fort Ord, 18 August 1993.

maintenance and utility operations to DLI/POM Annex on a status quo level.

TABLE 4.46
PROPOSED NPS PUBLIC WORKS ORGANIZATION

Division	Existing	Addition	Total
Office of the Dept. Head	2	0	2
Administration Division	3	1	4
Fiscal Division	5	3	8
Facility Support Division	7	6	13
Maint. Control Division	8	7	15
Engineering	10	7	17
Housing Management	8	3	11
Office of Shops Div. Head	2	0	2
Tool Room	4	2	6
Supervisory	12	9	21
Production Control	8	5	13
Emergency Service/Specifics	28	54	63
Standing Job Orders	19	10	29
Technical Services	13	9	22
Housing Maintenance	14	23	56
Total	143	139	282

(Source: NPS Public Works Department)

To ensure the NPS and Army organizations are comparable, only those functions that are performed by the Army's organization are included in the NPS organization. Basically, all of the facility support functions are the same except the Navy uses Public Works for transportation requirements.

The NPS PWD organization incorporates a Transportation Branch to maintain vehicles and equipment; the Army relies on

the Directorate of Logistics (DOL) to fulfill this function. Only equipment operators are included in the Army's DEH organization. Accordingly, the Navy organization has been adjusted to reflect the same overall functional abilities as the Army's organization.

D. COST ANALYSIS OF NPS PWD PROPOSED ORGANIZATION

To determine estimated labor costs for providing facility support to DLI and the POM Annex, the NPS Public Works Department organizational structure must be broken down into components and allocated to the respective installations. As discussed in Chapter III, the expanded NPS PWD organization was developed using a supplemental approach, i.e., determining the additional manpower/skill positions required. This supplemental approach enables the Navy to realize any possible economies of scale that would result from the increased organizational size.

Furthermore, this supplemental approach "shares" employees between the Army and Navy installations. This "sharing" results in a common labor pool which is allocated between the Army and Navy.

1. Identifying Common Labor Pool

The first step to estimate labor costs for each respective service is to identify employees constituting the "shared" labor pool. To do so, the proposed organization is broken down by division or branch and the component job

positions are reviewed to determine whether work is performed at one or both installations.

However, the details on implementing the proposed organization have not been fully addressed because there is still uncertainty about whether this consolidation will occur. Without comprehensive organizational plans, it is impossible to accurately identify common and direct labor. Therefore, input from the NPS PWO was obtained to ensure the results were consistent with his insight.

Tables 4.47-61 provide a breakdown of the proposed organization by division and branch. Both the existing organization's positions and the supplementary positions are indicated. Those job positions which perform work for multiple installations constitute shared labor and are shaded in the tables. The sum of the salaries of the "shared" employees comprise the common costs to be borne by both services.

TABLE 4.47

Office of Dept Head	Existing	Add	New
Public Works Officer	1	0	1
Assistant PWO	1	0	1
Total	2	2	2

(Source: PWD, NPS)

TABLE 4.48

Administration Division	Existing	Add	New
Admin. Officer	1	0	1
Asst. Admin. Officer	0	1	1
Admin. Support Asst.	1	0	1
Admin. Asst.	1	0	1
Total	3	1	4

(Source: PWD, NPS)

TABLE 4.49

Fiscal Division	Existing	Add	New
Supvr Fiscal Analyst	1	0	1
Lead Acctg. Tech.	0	1	1
Acctg. Tech.	3	2	5
Budget Asst.	1	0	1
Total	5	3	8

(Source: PWD, NPS)

TABLE 4.50

Facility Support Division	Existing	Add	New
Fac. Support Officer	1	0	1
Fac. Support Dir.	1	0	1
Contract Spec.	1	1	2
Contract Rep	1	1	2
QAE	2	3	5
Procurement Clerk	1	1	2
Total	7	6	13

(Source: PWD, NPS)

TABLE 4.51

Maint. Control Division	Existing	Add	New
Supvsr. Gen Eng.	1	0	1
Supvsr P&E	1	0	1
Planner & Estimator	4	3	7
Asst. P&E	1	1	2
Computer Specialist	1	1	2
Work Receptionist	0	1	1
Contract Writer	0	1	1
Total	8	7	15

(Source: PWD, NPS)

TABLE 4.52

Engineer Division	Existing	Add	New
Supvsr. Gen. Eng.	1	0	1
Clerk/Typist	0	1	1
Engineer	4	2	6
Eng. Tech.	2	2	4
Env. Prot. Spec.	3	2	5
Total	10	7	17

(Source: PWD, NPS)

TABLE 4.53

Housing Management	Existing	Add	New
Division Director	1	0	1
Fac. Mgt. Branch Head	1	0	1
Hsg. Mgt. Specialist	1	0	1
Hsg. Mgt. Asst.	3	1	4
Hsg. Assignment Clrk	1	1	2
Budget Analyst	1	1	2
Total	8	3	11

(Source: PWD, NPS)

TABLE 4.54

Office of Shops Division	Existing	Add	New
Shops Division Dir.	1	0	1
Admin. Asst.	1	0	1
Total	2	0	2

(Source: PWD, NPS)

TABLE 4.55

Tool Room	Existing	Add	New
Tool Room Leader	1	0	1
Tool Mechanic	1	2	3
Tool Room Clerk	2	0	2
Total	4	2	6

(Source: PWD, NPS)

TABLE 4.56

Direct Labor Supervision	Existing	Add	New
Maint. Supvsr II	2	1	3
Maint. Supvsr I	5	4	9
Work Leaders	5	4	9
Total	12	9	21

(Source: PWD, NPS)

TABLE 4.57

Production Control	Existing	Add	New
Production Controller Supvar	1	0	1
Production Controller	5	2	7
Mat'l Inspector	0	1	1
MVO/Mat'l Expeditor	1	1	2
Purchasing Agent	1	1	2
Total	8	5	13

(Source: PWD, NPS)

TABLE 5.58

Emergency Service/ Specifics	Existing	Add	New
Carpenter	3	6	7
Electrician	4	9	11
Pipefitter	2	3	5
Plumber	0	5	5
Equipment Operator	2	4	6
Locksmith	2	2	4
Maintenance Worker	4	0	4
General Helper	1	0	1
Laborer	5	0	5
Maintenance Mech.	1	22	8
Welder	2	1	3
Tile/Plate Setter	1	0	1
Painter	1	0	1
Roofer	0	2	2
Total	28	54	82

(Source: PWD, NPS)

TABLE 4.59

Standing Job Orders	Existing	Add	New
Power Mech.	1	0	1
Boiler Plant Operator	6	3	9
Water Treatment Operator	0	2	2
Maintenance Mech.	3	3	6
Electrician	1	0	1
Pest Control	1	2	3
Gardener	4	0	4
Laborer	1	0	1
Motor Vehicle Operator	1	0	1
General Helper	1	0	1
Total	19	10	29

(Source: PWD, NPS)

TABLE 4.60

Technical Services	Existing	Add	New
Computer Mech	1	0	1
Elevator Mech	1	0	1
Telephone Mech	2	0	2
Electrician	2	0	2
Electronics Tech	0	1	1
A/C Mech	4	4	8
Audio Visual	2	0	2
Laborer	1	0	1
Power Support Equip Mech.	0	2	2
High Voltage Electrician	0	2	2
Total	13	9	22

(Source: PWD, NPS)

TABLE 4.61

Housing Maintenance	Existing	Add	New
Production Controller	1	1	2
Electrician	1	4	5
Carpenter	2	5	7
Maint. Mech	3	9	31
Plumber	2	0	2
Maint Worker	4	4	8
General Helper	1	0	1
Total	14	23	37

(Source: PWD, NPS)

Reviewing these tables indicates that the vast majority of those positions that are "shared" represent overhead labor (the labor that performs managerial and support functions). This is consistent with NPS's supplemental approach to defining the overall manpower requirements. Since the organization is centralized at NPS, a shared overhead labor pool is logical. Furthermore, the overhead functions are typically where centralized organizations achieve economies of scale.

The complete common labor pool is summarized in Table 4.62. Out of the organization's 282 total personnel, 96 comprise the common cost pool to be allocated between the Army and the Navy.

TABLE 4.62
NAVY/ARMY COMMON LABOR POOL

Common Labor Pool		
Branch	Navy/Army	Average Salary
Office of the Dept. Head	2	military
Administration Division	4	\$24.8 k
Fiscal Division	8	\$24.6 k
Facility Support Division	12 1	\$28.6 k military
Maint. Control Division	15	\$41.8 k
Engineering	17	\$38.8 k
Housing Management	11	\$27.6 k
Office of Shops Div. Head	2	\$39.4 k
Tool Room	6	\$27.8 k
Production Control	13	\$27.1 k
Tech. Services	5	\$31.8 k
Total	96	

(Source: TABLES 4.47-61)

An average salary per division (or branch) is used to account for each of the individuals' salaries, as discussed in Chapter III. The average salaries are determined from the existing NPS PWD organization. An average salary per division or branch reasonably forecasts the additional employees' salaries. Table 4.62 also provides the average salary data as calculated from actual FY 1992 cost data.

No salary is provided for the organization's military service members. Because NPS is not a DBOF activity, it may not obtain reimbursement for costs associated with the salaries of active military service members. These salaries

are paid from the *Military Personnel* appropriation and are incidental to the *Operation and Maintenance* or *Family Housing* appropriations that fund facility support operations. Therefore, the costs associated with the Office of the Dept. Head (PWO and APWO) as well as with the Facility Support Officer (currently a Navy Ensign) are not included.

To develop an accurate and reasonable cost allocation, an allocation base representative of the actual labor resources directed to each service is derived below.

a. Allocation Base

To ensure that common cost allocations are reasonable, each division is individually analyzed to determine what drives the time employees spend performing their tasks. The cost driver for each division can be used to design an allocation scheme that represents actual performance costs.

Table 4.63 summarizes the appropriate cost drivers for each division. The Office of the Department Head (the PWO and the APWO) is not included because their military salaries are not allocated as discussed above.

TABLE 4.63
LABOR COST DRIVERS

Common Labor Allocation Bases	
Administration Division	No. of Supervisors
Fiscal Division	No. of Direct Labor Personnel
Facility Support Division	Total SqFt (Base Facilities/Housing)
Maint Control Division	No. of Direct Labor Personnel
Engineering	No. of Direct Labor Personnel
Housing Management	No. of Housing Units
Office of Shops Div. Head	No. of Direct Labor Personnel
Tool Room	No. of Direct Labor Personnel
Production Control	No. of Direct Labor Personnel
Tech Services	Square Feet of Base Facilities

The following subsections discuss the rationale behind the selected cost driver for each division:

(1) *Administration Division.* The Administration Division provides administrative support to the PWD staff and management. The vast majority of administrative support requirements represent overhead personnel. Therefore, it is logical to allocate the administration division's costs according to the number of overhead employees. However, all overhead labor except for the direct labor supervisors are shared employees. Only the number of direct labor supervisors assigned to each service is used for the allocation base.

(2) *Fiscal Division.* The fiscal division provides accounting and budgetary support to the entire PWD organization. Facility maintenance and utility operations generate the purchases, labor expenditures, and other

financial data tracked by this division. The number of employees performing direct labor work logically indicates the facility maintenance and utility operations performed at each installation. Thus, the number of direct labor employees provides an appropriate allocation base for this division's labor costs.

(3) *Facility Support Division.* The facility support division formulates and administers facility support contracts. This work is directly related to the number of facility support contracts that are implemented by each station and their content. Because the basic service contract requirements are similar across installations (refuse collection, janitorial, grounds maintenance), the contract content is the driving factor. Thus, total area being serviced by the contracts is an appropriate allocation base for their time.

(4) *Maintenance Control Division (MCD).* MCD is the centralized office for receiving, generating, and issuing maintenance orders. Much of its time is spent preparing work orders carried out by the direct labor personnel. Therefore, it is appropriate that its time be allocated by the number of direct labor employees at each installation.

(5) *Engineering Division.* The Engineering division prepares designs and resolves problems for work orders. It also performs specific design/engineering projects. However,

specific projects can not be forecasted. Thus, they can not be factored into the allocation base. In general, the Engineering Division's labor is proportional to facility work performed. It can be allocated by the number of direct labor employees at each installation.

(6) *Housing Management.* Housing management personnel time is spent administering housing operations. Thus, it is directly related to the number of houses for which it is responsible. It's labor cost is allocated on the number of housing units at each installation.

(7) *Office of the Shops Division Head.* This division includes the shops division director and secretary. The division director manages and supervises the entire shops division while the secretary provides administrative support. Their time will likely be spent in proportion to the number of shop employees assigned to each installation. Thus, the labor cost is allocated on the number of direct labor employees assigned to each installation.

(8) *Tool Room.* The tool room stores and issues tools that shop personnel require for performing maintenance duties. Therefore, their time is allocated according to the number of shops employees assigned to each installation.

(9) *Production Control.* Production control provides the material support for performing work orders by shop personnel. Their time is also allocated by the number of shops employees.

(10) *Technical Services.* Many of the technical services personnel that are designated as common labor work for both installations. Given that they perform the actual maintenance work on facilities, they are allocated on the amount of facilities space (square footage) existing at each installation.

b. Allocation of Common Costs

The common costs of the proposed organization can be allocated between the Army and the Navy using the above data. The number of employees multiplied by their respective average salary yields the total division labor cost to be allocated under its respective allocation base. The resulting allocation proportions are summarized in Table 4.64.

TABLE 4.64
COMMON LABOR ALLOCATION BASES

Number of Supervisors				
NPS	DLI/POM Annex	Total	% share NPS	% share DLI/POM Annex
12	9	21	57%	43%
Number of Direct Labor Personnel				
NPS	DLI/POM Annex	Total	% share NPS	% share DLI/POM Annex
70	95	165	42%	58%

(Table 4.64 Continued)

Total SqFt (Base Facilities & Housing - million SqFt)				
NPS	DLI/POM Annex	Total	% share NPS	% share DLI/POM Annex
2.6	3.8	6.4	41%	59%

Number of Housing Units				
NPS	DLI/POM Annex	Total	% share NPS	% share DLI/POM Annex
877	1203	2080	42%	58%

Square Feet of Base Facilities (million SqFt)				
NPS	DLI/POM Annex	Total	% share NPS	% share DLI/POM Annex
1.4	1.9	3.3	42%	58%

Applying the allocation bases to the common labor pool yields the costs allocated to both the Army and the Navy. The following tables illustrate the allocation method as carried out for each division.

TABLE 4.65

Administration Division			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Supervisors	
4	\$24.8 k	\$99.2 k	NPS 57%	DLI/POM Annex 43%
			\$56.5 k	\$42.7 k

TABLE 4.66

Fiscal Division			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number Direct Labor Personnel	
8	\$24.6 k	\$196.8 k	NPS 42%	DLI/POM Annex 58%
			\$82.7 k	\$114.1 k

TABLE 4.67

Facility Support Division			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Total SqFt	
12	\$28.6 k	\$343.2 k	NPS 41%	DLI/POM Annex 59%
			\$140.7 k	\$202.5 k

TABLE 4.68

Maint. Control Division			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Direct Labor Personnel	
15	\$41.8 k	\$627.0k	NPS 42%	DLI/POM Annex 58%
			\$263.3 k	\$363.7 k

TABLE 4.69

Engineering			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Direct Labor Personnel	
17	\$38.8 k	\$659.6k	NPS 42%	DLI/POM Annex 58%
			\$277.0 k	\$382.6 k

TABLE 4.70

Housing Management			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Housing Units	
11	\$27.6 k	\$303.6 k	NPS 42 %	DLI/POM Annex 58%
			\$127.5k	\$176.1 k

TABLE 4.71

Office of Shops Div. Head			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Direct Labor Personnel	
2	\$39.4 k	\$78.8 k	NPS 42%	DLI/POM Annex 58%
			\$33.1 k	\$45.7 k

TABLE 4.72

Tool Room			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Direct Labor Personnel	
6	\$27.8 k	\$166.8 k	NPS 42%	DLI/POM Annex 58%
			\$70.1 k	\$96.7 k

TABLE 4.73

Production Control			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of Direct Labor Personnel	
13	\$27.1 k	\$352.3 k	NPS 42%	DLI/POM Annex 58%
			\$148.0 k	\$204.3 k

TABLE 4.74

Tech Services			Allocation Basis	
# Personnel	Ave. Salary	Total Cost	Number of sq ft of Base Facilities	
5	\$31.8 k	\$159.0 k	NPS 42 %	DLI/POM Annex 58%
			\$66.8 k	\$92.2 k

The following table summarizes the resulting cost allocation for the NPS facility support organization's common labor pool.

TABLE 4.75
COMMON LABOR COST ALLOCATION SUMMARY

Common Labor Pool Cost Allocation			
Division	NPS	DLI/POM Annex	Total
Administration	\$56.5 k	\$42.7 k	\$99.2 k
Fiscal	\$82.7 k	\$114.1 k	\$196.8k
Facility Support	\$140.7 k	\$202.5 k	\$343.2k
Maint. Control	\$263.3 k	\$363.7 k	\$627.0k
Engineering	\$277.0 k	\$382.6 k	\$659.6k
Housing Management	\$127.5 k	\$176.1 k	\$303.6k
Office of the Shops Div. Head	\$33.1 k	\$45.7 k	\$78.8k
Tool Room	\$70.1 k	\$96.7 k	\$166.8k
Production Control	\$148.0 k	\$204.3 k	\$352.3k
Tech. Services	\$66.8 k	\$92.2 k	\$159.0k
Total	\$1265.7k	\$1720.6k	\$2986.3k

2. Identifying Navy/Army's Direct Costs

To complete the labor cost estimate attributable to for the Army and the Navy under the NPS proposed organization, all the direct costs associated with each respective installation must be compiled. Recall that direct costs are those that are fully attributable to one specific installation.

Although, as discussed above, the Navy's proposed organization was formulated on a supplemental approach that results in many common costs, there are also some direct costs. Because of the geographic separation of the installations, the organization is designed so that a number of employees will work for only one specific installation. This will facilitate providing the customer service and facility familiarity requirements. Also installation specific tasking may require specialized positions unique to only one installation.

Those positions which are not shaded in Tables 4.47-61 are employees who will be performing work at a particular installation. The salaries associated with these individuals comprise the direct costs for their respective installation. The list of direct cost employees is summarized in Table 4.76.

Multiplying the average salary for each division or branch by the number of employees assigned to each installation provides the installation's direct cost for that

division or branch. Table 4.77 shows the direct NPS and DLI/POM annex costs per division.

TABLE 4.76
DIRECT LABOR SUMMARY

Direct Cost Employees				
Branch	NPS	DLI/POM Annex	Total	Average Salary
Emerg Serv./Specifics	28	54	82	\$29.7 k
Standing Job Orders	19	10	29	\$29.2 k
Tech. Services	9	8	17	\$31.8 k
Housing Maint	14	23	37	\$29.5 k
Supervisory	12	9	21	\$40.3 k
Total Employees	82	104	186	

TABLE 4.77
DIRECT LABOR COST SUMMARY

Direct Costs Summary		
Branch	NPS	DLI/POM Annex
Emerg. Serv./Specifics	\$831.6 k	\$1603.8 k
Standing Job Orders	\$554.8 k	\$292.0 k
Technical Services	\$286.2 k	\$254.4 k
Housing Maintenance	\$413.0 k	\$678.5 k
Supervisory	\$483.6 k	\$362.7 k
Total	\$2569.2 k	\$3191.4 k

3. Total Cost Per Installation

The total labor cost for both the Army and Navy is computed by adding the direct and allocated common costs as determined above. The results are provided in Table 4.78.

TABLE 4.78
ARMY/NAVY TOTAL LABOR COST SUMMARY

	NPS (Navy)	DLI/POM Annex (Army)
Allocated Common Costs	\$1265.7 k	\$1720.6 k
Direct Costs	\$2569.2 k	3191.4 k
Total	\$3834.9 k	\$4912.0 k

a. Family Housing/Installation Facilities Funding

Because Congress appropriates separate funds for family housing and base operations, labor costs must be funded with the right appropriation. Family housing management, maintenance and operations, and any overhead labor attributable to family housing, is to be paid with family housing appropriations. All other base facility operation and maintenance functions are funded by the O&M appropriation.

Total labor costs must be allocated between housing and base operations. Housing maintenance and housing management labor are obviously direct costs of family housing. However, other divisions support housing. Thus, they require reimbursement from the family housing appropriation.

Engineering, Facility Support, Maintenance Control, Office of the Shops Division Head, Supervision, and the Tool Room all support housing. In keeping with the allocation rational previously discussed, the allocation bases illustrated in Table 4.78 are used for family housing overhead.

All of the above listed divisions or branches provide overhead support to housing on a routine basis. Because this support is routine, the costs can be allocated in a representative manner. On the other hand, housing occasionally receives support from other direct labor branches (such as the Emergency/Specifics Branch) on a non-routine basis. Because of the irregular and infrequent nature of this support, non-housing direct labor is not allocated.

TABLE 4.78
COMMON LABOR ALLOCATION BASES

Division	Allocation Base
Engineering	No. Direct Labor Personnel
Facility Support Contracts	Total SqFt (Hsg & Non-Hsg)
Maint. Control	No. Direct Labor Personnel
Office of the Shops Div Head	No. Direct Labor Personnel
Supervision	No. Supervisors
Tool Room	No. Direct Labor Personnel

When applied to the NPS data, the three allocation bases found in the above table result in the percentages presented in Table 4.79.

TABLE 4.79
NPS HOUSING/INSTALLATION ALLOCATION PERCENTAGES

NPS Housing/Non-Housing Allocation Bases				
No. of Direct Labor Personnel				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
14	56	70	20%	80%
Total SqFt (million SqFt)				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
1.2	1.4	2.6	46%	54%
No. of Supervisors				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
2	10	12	17%	83%

Applying the allocation proportions to each of the divisions or branches contributing to both housing and non-housing functions, and segregating the direct housing operations and maintenance labor costs yields the results presented in Table 4.80.

TABLE 4.80
NPS HOUSING/INSTALLATION LABOR COSTS

NPS Family Housing/Installation Facilities Allocation				
Division	Housing	Non-Housing	Total	Allocation Base
Administration	0	\$56.5 k	\$56.5 k	N/A
Fiscal	0	\$82.7 k	\$82.7 k	N/A
Facility Support	\$64.7 k	\$76.0 k	\$140.7 k	Total SqFt
Maint. Control	\$52.7 k	\$210.6 k	\$263.3 k	No. DL Personnel
Engineering	\$55.4 k	\$221.6 k	\$277.0 k	No. DL Personnel
Housing Management	\$127.5 k	0	\$127.5 k	N/A
Office of the Shops Div. Head	\$6.6 k	\$26.5 k	\$33.1 k	No. DL Personnel
Tool Room	\$14.0 k	\$56.1 k	\$70.1 k	No. DL Personnel
Production Control	0	\$148.0 k	\$148.0 k	N/A
Emerg. Serv./Specifics	0	\$831.6 k	\$831.6 k	N/A
Standing Job Orders	0	\$554.8 k	\$554.8 k	N/A
Tech. Services	0	\$353.0 k	\$66.8 k	N/A
Supervisory	\$82.2 k	\$401.4 k	\$483.6 k	# Supvrs.
Housing Maintenance	\$413.0 k	0	\$413.0 k	N/A
Total	\$816.1 k	\$3018.8 k	\$3834.9 k	

Repeating the process for the Army yields the allocation proportions summarized in Table 4.81.

TABLE 4.81
ARMY HOUSING/INSTALLATION ALLOCATION PERCENTAGES

DLI/POM Annex Housing/Non-Housing Allocation Bases				
No. of Direct Labor Personnel				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
42	53	95	44%	56%
No. of Supervisors				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
3	6	9	33%	67%
Total SqFt (million SqFt)				
Housing	Non-Housing	Total	% Hsg	% Non-Hsg
1.9	1.9	3.8	50%	50%

Applying the allocation proportions to each of the divisions or branches contributing to both housing and non-housing functions and segregating the direct operations and maintenance labor costs of housing yields the results for the Army as presented in Table 4.82.

TABLE 4.82
ARMY HOUSING/INSTALLATION LABOR COSTS

DLI/POM Annex Family Housing/Installation Facilities Allocation				
Division	Housing	Non-Housing	Total	Allocation Base
Administration	0	\$42.7 k	\$42.7 k	N/A
Fiscal	0	\$114.1 k	\$114.1 k	N/A
Facility Support	\$101.25 k	\$101.25 k	\$202.5 k	Total SqFt
Maint. Control	\$160.0 k	\$203.7	\$363.7 k	No. DL Personnel
Engineering	\$168.3 k	\$214.3 k	\$382.6 k	No. DL Personnel
Housing Management	\$176.1 k	0	\$176.1 k	N/A
Office of the Shops Div. Head	\$20.1 k	\$25.6 k	\$45.7 k	No. DL Personnel
Tool Room	\$42.5 k	\$54.2 k	\$96.7 k	No. DL Personnel
Production Control	0	\$204.3 k	\$204.3 k	N/A
Emerg. Serv./Specifics	0	\$1603.8 k	\$1603.8 k	N/A
Standing Job Orders	0	\$292.0 k	\$292.0 k	N/A
Tech. Services	0	\$346.6 k	\$346.6 k	N/A
Supervisory	\$119.7 k	\$243.0 k	\$362.7 k	# Supvrs.
Housing Maintenance	\$678.5 k	0	\$678.5 k	N/A
Total	\$1466.45k	\$3445.55k	\$4412.0 k	

b. Housing/Installation Facilities Summary

The resulting labor cost estimates for both the Army and the Navy under the NPS facility support proposal as segregated by housing and installation facility functions is summarized in Table 4.83.

TABLE 4.83
ARMY NAVY TOTAL LABOR COSTS, HOUSING/INSTALLATION

	Housing	Installation Facilities	Total
Navy	\$816.1 k	\$3,018.8 k	\$3,834.9 k
Army	\$1,466.45 k	\$3,445.55 k	\$4,412.0 k

V. RESULTS AND CONCLUSIONS

A. COMPARISON OF HISTORICAL COSTS

To begin analyzing the data presented in Chapter IV, we first consider the historical cost data for fiscal year 1992. Table 5.1 presents the unit (or average) cost data as calculated in this study. The data reflects the total cost of facility support (less construction contracting and transportation) as provided by the respective Army and Navy facility support organizations. As indicated in the table, there is a significant disparity in facility support costs between the two organizations.

TABLE 5.1
FY 1992 HISTORICAL FACILITY SUPPORT COSTS

Annual Facility Support Cost (FY 92 \$)		
	Installation facilities	Housing ¹⁷
Navy - NPS	\$6.35 per sqft	\$4,180 per unit
Army - overall	\$2.43 per sqft	\$3,114 per unit

(Source: Tables 4.4 and 4.10)

¹⁷ This cost data is inclusive of all facility support costs incurred by housing as the relevant costs of concern could not be fully segregated from Army cost data. Fire protection, police protection, material, and utility costs are included in addition to labor and contract costs.

According to the data, the Navy was providing facility support services at a unit cost approximately 2.6 times greater than the Army for installation facilities and about 1.3 times greater than the Army for family housing. However, the Army organization was vastly larger than the Navy's. The Army supported 11.3 million square feet of installation facilities and 5,943 family housing units compared to the Navy's 1.4 million square feet of facilities and 877 units.

Given the substantial size differences between the two organizations, the disparity in unit costs is not unreasonable. In fact, it is consistent with returns to scale in a large, centralized facility support organization.

FORSCOM funded a large facility support organization centralized at Fort Ord vice several smaller decentralized and autonomous organizations located at each specific installation.¹⁸ This created economies of scale that reduced the Army's unit costs relative to the Navy. In contrast, the Navy does not realize these returns to scale as they use their own separate and autonomous facility support organization. The overhead requirements for supporting such a small installation result in relatively high unit costs.

¹⁸ Although there are some facility support personnel stationed at each installation, they are by no means self-sufficient and rely on the central Fort Ord organization for support. Their existence is necessitated by the geographical separation of the various installations.

This is not to imply that the entire difference in unit costs is based upon returns to scale. The cost disparity also reflects differences in operating procedures and strategies as discussed in Chapter III. The Navy puts a higher priority on preventive maintenance, so its "up-front" operating costs are higher than the Army's (hopefully, in return for savings later on).

Further research into the unit cost disparity between the Army and the Navy is required to obtain more detailed insight into the underlying explanations. Although it is likely that various factors are behind this unit cost difference, this study is primarily concerned with the impact of returns to scale on a large centralized organization. Though the specific impact can't be quantified, it appears that the economies attained by a large centralized organization play a role in the unit cost disparity between the Fort Ord and the NPS facility support organizations.

B. COMPARISON OF PROPOSED ORGANIZATIONS

In addition to the historical cost data, Chapter IV also provided Army and Navy data to support DLI and the POM Annex after closing Fort Ord. The organizational data provided by NPS PWD was current and based upon the BRAC 1993 recommended size and content of the POM Annex. However, current Army organizational data was not available and thus required estimation.

Validated organizational requirements for the much larger BRAC 1991 recommendations were used as a baseline. The method used for revising the Army 1991 baseline acknowledges that there are fixed and variable positions within the organization. This distinction is incorporated into the estimating process. Although the estimated revision may have minor errors in specific positions, it provides a reasonable estimate of the resulting organizational requirements.

The following subsections will analyze the composition and cost for the proposed Navy and forecasted Army organizations. By first looking at the general composition of the two organizations, efficiencies inherent to each organization can be identified. Comparing the estimated costs associated with each organization will indicate whether organizational efficiencies actually translate into a cost benefit.

1. Organizational Efficiencies

This study hypothesizes that a single, centralized organization can support the remaining Monterey Peninsula military installations more efficiently than two smaller, decentralized organizations. The assumption behind this statement is that a larger, centralized organization can capture operational economies of scale. Analyzing and comparing the proposed enlarged Navy Public Works organization

to the Army facility support organization (sized to operate autonomously) helps indicate whether this assumption is valid.

a. Returns to Scale

To realize economies of scale, an organization must be able to *double its output at less than twice the cost*.¹⁹ In other words, an organization must produce twice the amount of output with less than twice the total of resource inputs. Savings can be attained by increases in the direct labor efficiency. They also can be driven by economizing on overhead when separate and autonomous organizations are consolidated into a single organization.

The proposed Navy organization can be broken up into its overhead and direct labor components as illustrated in Table 5.2 below.

TABLE 5.2
EXPANDED NPS PUBLIC WORKS, DIRECT/OVERHEAD COMPONENTS

Navy's Proposed Organization	Existing	Additional
Direct Labor	74	96
Overhead	69	43
Total	143	139

(Source: Table 4.46)

¹⁹ Robert s. Pindyck, Daniel L. Rubinfeld, Microeconomics, Second Edition, Macmillan Publishing Co., 1989, pg 217.

The overhead portion of the organization consists of the employees who perform the necessary supervisory and support functions. The direct labor portion consists of those individuals who perform actual facility maintenance or utility operation tasks.

If economies of scale can be achieved by facility support organizations, one would expect to see it reflected in the organizational makeup of the proposed NPS public works organization. To perform this type of analysis, the output must be defined. In the case of facility maintenance and utility operations, the output is service to buildings and installations. One common way to unitize this output is to use the area (square feet) of building/facility space being serviced.

In this case, the facility support responsibility is increased by over 146 percent.²⁰ The amount of labor input is increased by less than 100 percent. Thus, it appears that the proposed organization does in fact capture economies of scale.

The vast majority of savings apparently comes from savings in overhead labor requirements. As indicated in Table 5.2 above, the present NPS PWD organization has 69 overhead employees. As the area of responsibility more than doubles,

²⁰ NPS's 2.6 msf (housing and non-housing) currently serviced by PWD, is increased by 3.8 msf (housing and non-housing) in the DLI/POM Annex.

only 43 additional overhead employees are added. This equates to a 146 percent increase in output with only a 62 percent increase in overhead.

b. Direct/Overhead Labor Ratio

The resulting impact of organizational size on overhead labor requirements is further illustrated in the direct and overhead labor percentages shown in the tables below. Both organizations provide facility support internally with their direct labor force.²¹ Since both organizations perform in essentially the same manner, the relative efficiency of each organization can be illustrated by their resulting direct labor ratio. Table 5.3 presents the ratios as derived from each organizational proposal.

The data in the table indicates a significant disparity in the direct labor ratios between the two organizations. While direct labor comprises sixty percent of the expanded Navy organization, the Army organization implements a direct labor percentage of less than thirty percent. This finding illustrates the enormous overhead requirement of autonomous facility support organizations.

²¹ Both organizations will use service contracts to augment the direct labor force to a degree. Only in housing unit maintenance is the reliance on contracts significantly different.

TABLE 5.3
DIRECT/OVERHEAD LABOR RATIOS

Army	No. of Personnel	Percent
Direct Labor	31	28%
Overhead Labor	81	72%
Total	112	100%

Navy	No. of Personnel	Percent
Direct Labor	170	60%
Overhead Labor	112	40%
Total	282	100%

(Source: Tables 4.16, 4.40, 4.46)

The Army's low direct labor percentage can be partially attributed to their greater reliance on contract labor in support of housing. Nevertheless, compensating for this fact will not significantly decrease the disparity.²² The Army's direct labor percentage remains quite low when compared to that of the single large Navy organization.

Using a separate and autonomous Army organization requires a relatively large overhead structure to support its operations. The data indicates that for every direct labor employee, there are approximately three indirect or overhead employees. Consolidating all facility support under a large Navy organization improves the direct labor/overhead ratio to 1 to 0.67. There are proportionately more individuals

²² Even doubling the number of full time direct labor employees in the Army organization results in only a 43 percent direct labor ratio.

providing actual facility support services than there are performing indirect and overhead functions.

Of course, our estimate of the Army's direct labor force could be too low or the overhead pool too high. To confirm our results, the *direct to overhead labor ratio* is compared with the ratio of the original validated Army organization (used as a baseline for our estimate). The validated organization is comprised of more than two overhead employees for each direct labor employee.²³

The current NPS organization, which operates autonomously, has a *direct to overhead labor ratio* of about one to one. This is also notably higher than the ratio under the expanded NPS organization. Comparing the resulting ratios for each of the cases illustrates that operating a small and independent facility support organization demands a relatively large overhead burden.

2. Estimated Labor Costs

Regardless of whether there are apparent efficiencies associated with a large centralized organization vice smaller decentralized organizations, the overall cost remains the bottom line. There are numerous other factors inherent to the

²³ This ratio of 2:1 is not inconsistent with the ratio of 3:1 obtained from our estimate of the reduced Army organization. The ratio would not remain constant as the organization is reduced. Despite the reduction in direct labor requirements (and thus direct labor personnel), numerous overhead positions remain fixed regardless of number of direct labor personnel. This forces the ratio to change.

two organizations that may overshadow any scale economies. Therefore, the differential costs associated with each organization will be estimated to determine if these efficiencies actually translate into cost savings. In analyzing labor costs, it is assumed that both organizations have sufficient resources and ability to satisfactorily meet the facility support requirements. The following tables provide the labor and housing service contract costs for DLI and the POM Annex for each organization. The housing service contract costs are discussed below.

TABLE 5.4
NAVY ORGANIZATIONAL COSTS

Estimated Annual Labor Costs For DLI/POM ANNEX (FY 92 \$)		
Navy Organization	Installation Facilities	Housing
Labor Cost	\$3.446 million	\$1.466 million
Housing Contract	N/A	\$0.359 million
Total	\$3.446 million	\$1.825 million

Estimated Annual Labor Costs For NPS (FY 92 \$)		
Navy Organization	Installation Facilities	Housing
Labor Cost	\$3.019 million	\$0.816 million
Housing Contracts	N/A	\$0.262 million
Total	\$3.019 million	\$1.078 million

(Source: Table 4.83)

TABLE 5.5
ARMY ORGANIZATIONAL COSTS

Estimated Annual Labor Costs For DLI/POM ANNEX (FY 92 \$)		
Army Organization	Installation Facilities	Housing
Labor Cost	\$2.290 million	\$1.854 million
Housing Contract	N/A	\$1.524 million
Total	\$2.290 million	\$3.378 million

(Source: Table 4.45)

Only the differential costs are relevant to this analysis. They make one organization less or more expensive than the other. We assume that material costs are the same for both organizations. Contract costs are also considered equal with the exception of housing service contracts. Because the Army organization is set up to use service contracts for routine housing maintenance to a much greater extent than the Navy organization, the housing contract costs are differential costs that cannot be overlooked. Conversely, both organizations apparently plan to use the same amount of service contracts for installation facility support (for example, janitorial, refuse collection, and grounds maintenance). Thus, these contracts will result in approximately the same cost to either organization. They are therefore not a differential cost, and are not estimated here.

FY 1992 historical cost data was used to estimate the housing service contract costs. The Army's total housing contract costs were prorated over its housing units. The same

approach was used for the Navy. This assumes that both organizations will continue to perform roughly the same amount work under contract. In FY 92, the Army spent \$7.531 million on housing service contracts and maintained 5,943 housing units. This results in an average contract cost of \$1,267 per unit. This cost is distributed over the 1,203 units now planned. The Navy spent \$262,000 on housing contracts and maintained 877 housing units. This results in an average cost of \$299 per unit to be distributed over the 1,203 units planned.

In comparing the resulting costs of both organizations, we see that the Navy's overall cost of facility support (both housing and installation combined) appears to be slightly less than the Army's. The Army's total differential costs for supporting DLI and the POM Annex is \$5.668 million. The Navy's cost is \$5.271. This represents a difference of about \$0.4 million or approximately 7 percent. Thus, the organizational efficiencies do apparently translate into a small cost benefit when costs are viewed in their entirety.

The Navy's cost advantage comes from its housing support costs. Its total estimated cost for housing support is almost \$1.6 million less than the Army's estimate. Conversely, the Navy's estimated labor cost for DLI/POM Annex installation support is over \$1.1 million higher than the Army's, a result that contradicts the economies of scale argument.

Further review of our analysis identified several factors contributing to these results. First, the Army labor cost allocations which we made between housing and installation facilities may not accurately reflect the true costs. Further research into the Army's organization is required to clarify and validate the division of labor between housing and installation facilities. A different allocation base, such as overhead hours, may better allocate overhead costs. However, lack of Army overhead manhour data prevented checking this calculation here.

Second, there is a significant disparity in the number of direct labor employees between Army and Navy organizations. The Army organization is composed of only 31 direct labor employees to maintain the DLI/POM Annex while the Navy utilizes about 90 direct labor employees. It is questionable whether 31 direct labor employees can maintain 1.9 million square feet of installation facilities and 1203 housing units.²⁴

The Army may be able to temporarily provide support with this number of direct labor positions. However, the labor requirement will increase over time with increases in the maintenance backlog. The question arises, *How long will they be able to maintain the installation before the backlog*

²⁴ NPS currently uses 74 direct labor employees to maintain 1.4 million square feet of installation facilities and 877 housing units.

becomes extremely large and costs grow out of control? This question raises a significant issue: a short term cost advantage may turn into a substantial future cost detriment.

On the other hand, Navy organizational requirements could also be overstated. In fact, it appears that there is probably some overstatement. For example, the number of maintenance personnel (twenty) designated for barracks maintenance at DLI appears several times larger than what is actually needed. Nevertheless, judging the correct labor requirement is beyond the scope of this thesis.

The question regarding the amount of manpower required to provide adequate facility support is a significant issue. It is associated with the variability in service levels and differences in standard operating procedures between the two organizations. However, it also brings forth the possibility of hidden agendas and incentives behind the proposed organizations. These must be filtered out in order to truly determine which option is most cost effective. To resolve the manpower issue, further research into the actual support requirements is necessary. The backlog maintenance and specific statements of work must be reviewed to objectively validate the manpower requirements.

Analyzing the proper manpower requirements for supporting both DLI and the POM Annex is beyond the scope of this thesis. Unfortunately, it is an issue that may affect data and conclusions. The uncertainty brought on by the

difficulty in allocating the Army's labor between housing and installation support is removed by restricting further analysis to the total cost of overall support (both housing and installation). The combined costs indicate each organizations' overall cost effectiveness and the allocation between housing costs and installation facility costs is of little relevance.

Thus, the only issue remaining is whether the amount of labor is overstated or understated by the individual proposals. As previously stated, this question is beyond the scope of this research and it can only note the significant differences in direct labor estimates.

Table 5.6 provides the average total differential cost per square foot for both the Army and the Navy organizations. The number of housing units was converted to square feet of housing based on total square footage data obtained from both services. NPS' housing contains 1.4 million square feet while DLI/POM Annex's housing contains 1.9 million square feet.²⁵

This data simply restates the results from previous tables. The overall cost effectiveness (for both housing and installation support) is improved under a shared centralized facility support organization. The data indicates that both NPS and DLI will realize savings by consolidating their

²⁵ The square feet of the housing to remain at the DLI/POM Annex was estimated by reducing the total square feet of housing (9.3 msf for Fort Ord, FHL, DLI) in proportion to the reduction in number of housing units (5,943 to 1,203 units).

facility support needs under an expanded NPS public works organization.

TABLE 5.6
COST PER OVERALL SQUARE FEET

DLI/POM Annex	
Navy Expanded PWD	Army
\$1.39 / sqft	\$1.49 / sqft
NPS	
Navy Expanded PWD	Original PWD ²⁶
\$1.58 / sqft	\$1.76 / sqft

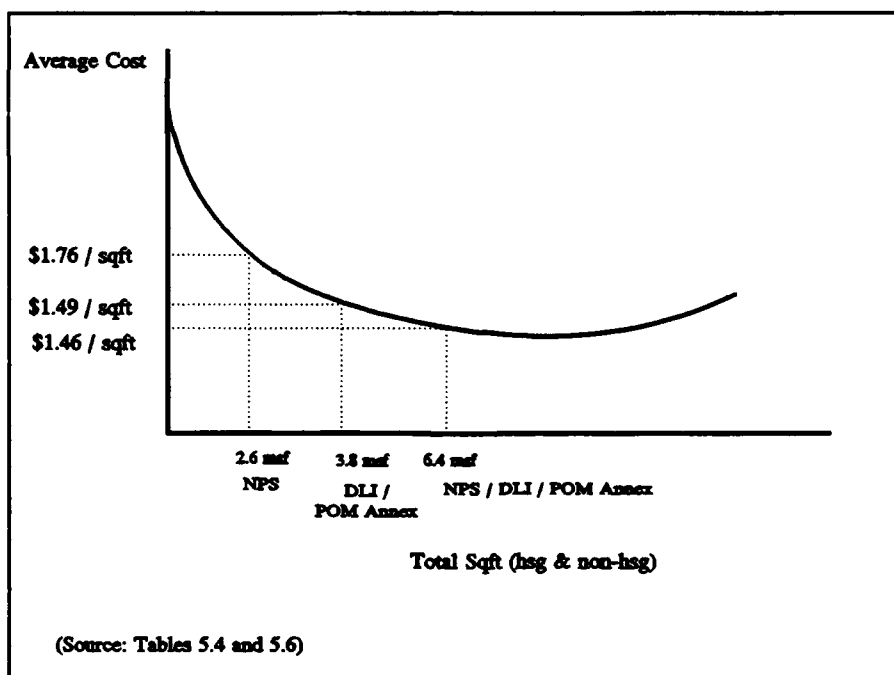
(Source: Table 5.4 and 5.5)

The cost advantage for the expanded NPS PWD is attributed to the lower overhead burden inherent to the large centralized organization. The Navy needs only to supplement its overhead component. The Army must retain a full complement of overhead positions. The Navy is able to effectively lower its per unit overhead burden by expanding output (additional facility support performance) because there is less than a proportional increase in total overhead labor.

Figure 5.1 presents a hypothetical average cost curve for a facility support organization. The curve illustrates the situation in which savings accrue by using one large organization vice separate smaller organizations. If DLI relied on its own Army organization, and NPS continued status

²⁶ Calculated from NPS Comptroller accounting data (FY 92).

quo, both organizations would be operating with relatively high unit costs. Using two separate and autonomous facility support organizations increases unit costs because of the large overhead structure required by each organization. However, if DLI consolidates its support requirements with NPS and relies on an expanded NPS organization, the unit cost is effectively reduced. A single overhead structure is created in which the costs are shared between the two organizations. The centralized overhead structure contains fewer employees than in two individual and autonomous organizations, providing cost savings through returns to scale.



Hypothetical Average Cost Curve
Figure 5.1

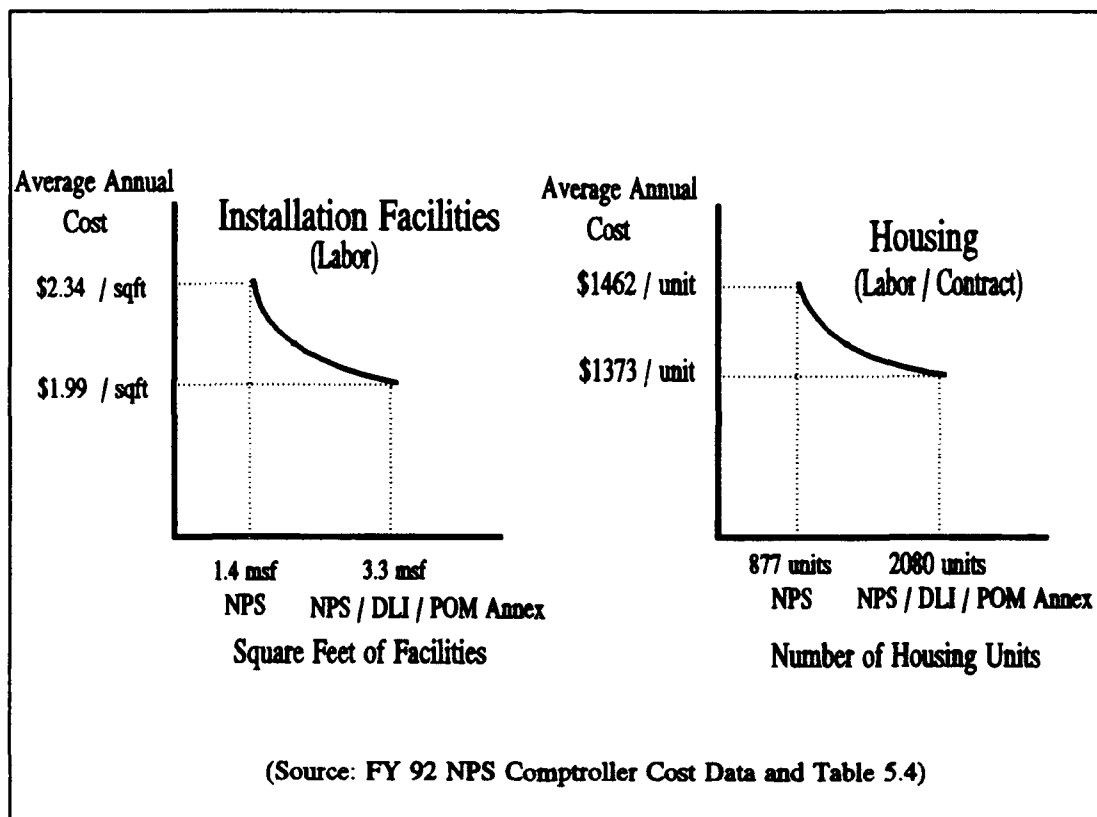
C. IMPACTS TO NPS UNDER EXPANDED PWD

As is illustrated in the previous section, expanding the NPS PWD to support the DLI/POM Annex reduces NPS's costs. Presumably, NPS would chose not to support DLI unless it could capture some of the economies of scale in its own internal costs. It is not NPS's responsibility to subsidize the DLI/POM Annex. Because "win/win" results are important for both the Army and the Navy to accept consolidation, the impacts to NPS are analyzed further.

The NPS comptroller's FY 1992 accounting records reveal that the labor cost for installation support was \$3.271 million, the labor cost of facility support for housing was \$1.046 million, and housing contract costs were \$0.262 million. Dividing the installation labor cost by the area of installation facilities yields a cost of \$2.34 per square foot. Combining the housing labor and contract costs and dividing by the number of housing units yields a unit cost of \$1,462 per unit.

These unit costs can be compared with the costs estimated for the expanded NPS public works organization. As presented above, the labor cost for installation support was estimated at \$3.019 million and the total labor/contract cost for housing support was estimated at \$1.078 million. This translates to \$1.99 per square foot for installation support and \$1,373 per housing unit for housing support.

Figure 5.2 illustrates the efficiency and savings that could be attained. Again, sharing the numerous overhead positions between DLI and NPS reduces the actual cost that NPS must bear if run independently.



NPS Cost Impact
Figure 5.2

D. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

It is evident that returns to scale can be realized under a centralized facility support organization. Returns to scale were noted in comparing the cost of the large Fort Ord facility support organization (servicing Fort Ord, DLI, and Fort Hunter Liggett) with the small, autonomous NPS facility support organization (servicing only itself).

Expanding the NPS PWD organization increases returns to scale and can effectively reduce the cost of supporting the DLI/POM Annex (as well as NPS itself). The returns reflect significant savings in the facility support organization's overhead structure.

However, the cost savings determined in this study are relatively small. As illustrated above, the overall savings is only \$0.4 million. This small cost advantage could easily be reversed through possible estimation errors in the study's forecasts and/or assumptions.

However, the actual manpower structures of the two organizations support the economies of scale argument. Despite the small differences in total costs, a much larger direct work force is obtained under the expanded NPS public works organization. Because of the savings in the overhead structure, an expanded public works organization can provide a much larger (about 3 times) direct labor force while still

remaining less costly than a separate Army facility support organization (or at least extremely competitive if there are off-setting errors).

Therefore, expanding the NPS public works organization to provide consolidated facility support to the military installations of Monterey is more cost effective than using separate and individual organizations. In stating this, one further assumption is noted. Start up costs were not addressed in this study. Expanding the NPS public works organization will undoubtedly require various start up costs. The organization's plant, property, and equipment must be sized so as to support more employees and the DLI/POM Annex. This thesis assumes that any initial start up costs are minimal and have a quick payback from the cost savings.

From discussions with the NPS Public Works Officer, it appears that the existing plant, property, and equipment is essentially adequate and no major capital expenditures are required to support a large increase in the labor force. Additional tools, equipment, and vehicles are required, but much of this can probably be acquired from closing Navy bases in the San Francisco Bay area or assumed from the Fort Ord Department of Engineering and Housing.

a. Limiting Factors

The conclusions stated here are supported by the data available. However, there are some limiting factors that may affect the study's results.

While gathering data, Fort Ord would not provide DEH maintenance records, accounting records, manhour records, and statements of work. Concern for job preservation in the base closure environment made this information politically sensitive. Because of this limitation, manpower requirements were estimated based on the 1991 USAFISA survey results. While these estimates are generally accurate, decisions on the ultimate outcome of the DLI and the POM Annex could be better made using actual data.

Additionally, several factors influenced the ability to collect impartial data. While the data received is not false, factors are present which could encourage skewing the data to benefit one organization or another. The Navy had no incentive to propose an organization that minimized requirements. In fact, the internal NPS organization could only benefit by adding positions which were previously precluded under the current fiscal constraints. Even if the Navy's resulting estimate was higher than the Army's, NPS would still continue under their present configuration and organizational strength. In other words, the NPS public works organization could only gain from this approach.

On the other hand, employees within Fort Ord's Department of Engineering and Housing could help preserve their employment by reducing the Army's overall cost. This factor encourages understating the requirements to lower perceived future costs.

It is necessary to judge the composition of the organizations and to validate them against the actual support requirements. However, this is beyond the scope of this thesis. Thus, it is considered a limiting factor. An impartial outside organization with expertise in manpower analysis and full access to facility support records may be best suited to validate the organizational structure.

Our analysis was based entirely on cost. Although cost is an important aspect, one must always consider the impact and costs of displaced personnel. Also, "corporate knowledge" of key individuals may be lost in consolidating support with NPS. As the costs of the two alternatives become closer, decision makers should pay more attention to these impacts.

2. Recommendations

Based on these conclusions and in light of the limitations, a centralized Navy organization to consolidate facility support for the military on the Monterey Peninsula is recommended. Using an expanded NPS PWD appears to offer a "win/win" situation for both DLI and NPS. The relative

increase in efficiency translates into cost savings for both installations. However as stated above, there are some limitations and assumptions that play an important role in this conclusion. Further research into these areas may improve the creditability of the recommendation.

a. Subjects For Further Research

Areas requiring further research are as follows:

- Allocation methods for overhead costs within facility support organizations. Specifically, in a centralized facility maintenance organization at NPS, which cost drivers and methods best allocate PWD overhead costs to housing and installation maintenance.;
- Detailed analysis of direct and indirect labor requirements for the DLI and the POM Annex after closing Fort Ord. An objective review of the facility support requirements is necessary to validate proposed organizational manpower structures.;
- The cost effectiveness of preventative maintenance in facility support operations. A comparison of the labor and material costs of Fort Ord's DEH versus that of NPS' PWD is necessary to substantiate the advantage of a large direct labor force.;
- A cost/benefit analysis on the use of direct labor versus commercial activities (contracts) for housing maintenance. It is possible that the Army's extensive use of contract labor for housing maintenance is more cost effective than using "in-house" labor. This may lead to greater efficiency in the NPS public works organization.;
- An analysis of transitional issues and a proposed implementation plan. Differences between Army and Navy facility support organizations and their standard operating procedures can prevent a smooth transition as well as hamper future operations. Both organizations must be prepared for such organizational change.;

- An analysis and proposal for a cost accounting and cost allocation scheme for a centralized facility support organization. If DLI was to consolidate its facility support requirements with NPS, an equitable billing system is required. It is questionable whether NPS's current accounting procedures are adequate to fulfill this need.; and
- Other areas of base operations support may also be more economically performed by consolidation with NPS. There are possibly returns to scale associated with other functions such as supply operations. It is possible that consolidation in these other areas would be economically beneficial.

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4. William R. Gates (AS/GT) Naval Postgraduate School Monterey CA 93943-5002	1
5. LT Jonathan Landis MCAS Kaneohe Bay, Facility Dept. Kaneohe Bay, HI 96863-5001	1
6. LT Andrew C. Wood 150 River Drive Lancaster, PA 17603	1